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Archaeological Investigations at Yaquina Head, Central Oregon Coast

Rick Minor
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Cultural Resource Series No. 1

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major resonsibility for American Indian reservation communities for people who live in Island Territories under U.S. administration.

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ARCHAEOLOGICAL INVESTIGATIONS AT YAQUINA HEAD, CENTRAL OREGON COAST

by

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Report to

Bureau of Land Management
Salem District

Heritage Research Associates
2008 Onyx Street
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FOREWARD

Distribution of this volume marks the inception of a cultural resource publication series for the BLM in Oregon and Washington. The objective of the series is to inform the public and cultural resources professional community of the more significant efforts of the BLM toward the identification and management of cultural resource values in the Pacific Northwest. Topics to be addressed in the series include investigations of archaeological sites pertaining to the prehistoric and historic periods, historical research projects, and traditional activities still conducted today by the Northwest's Native Americans relevant to public land use issues.

This first volume addresses one of the most important cultural resource sites BLM manages in Oregon, the Yaquina Head prehistoric archaeological site located in the Salem District. The site offers a wide range of values including (1) cultural (being of paramount interest to Indian peoples today), (2) scientific (being one of the more informative sites yet discovered on the Oregon coast in terms of prehistoric human lifeways), and (3) public (being a location already attracting thousands of persons a year primarily for its exceptional natural history values). Opportunities to the BLM at this site include protection of the heritage values in coordination with Indian peoples and interpretation of the rich Pacific Northwest cultural heritage for the general public.

This report describes the findings of the first of three phases of archaeological excavations at the Yaquina Head vicinity. All three phases have been stimulated by recreational and associated development to accomodate the already heavy use of the area. A report on the second phase of fieldwork, conducted in 1988, will be published as the third volume in this BLM series and the recently completed 1989 third fieldwork phase will be reported later.

Richard C. Hanes
Series Editor

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ABSTRACT

Archaeological investigations were sponsored by the Bureau of Land Management in 1986 at a prehistoric archaeological site (35LNC62) at the tip of Yaquina Head, a prominent headland on the central Oregon coast. The results of these investigations indicate that this locality was occupied between 5000 and 2000 years ago, making this the second oldest archaeological site so far documented on the Oregon Coast. Two cultural components were identified at the prehistoric settlement on Yaquina Head.

The Yaquina I component is represented by cultural materials recovered from below a marine shell midden, and is estimated to date from approximately 5000 to 3200 BP. Initial evidence of the use of the headland by prehistoric peoples was sparse, and during Yaquina I times the site apparently functioned as an occasional summer encampment. Faunal remains indicate that animals from both marine and terrestrial habitats were hunted by the site's inhabitants during this period.

The Yaquina II component contains evidence of more intensive use of the headland, including exploitation of marine molluscs, and is estimated to date from 3200 to 2000 BP. During this period Yaquina Head was the setting of a village containing semisubterranean housepits that was occupied throughout the year. A wide range of subsistence and manufacturing activities took place at the site, and faunal remains indicate that a variety of resources was exploited, including animals from terrestrial habitats, as well as shoreline, nearshore, and offshore marine environments.

Yaquina II includes cultural materials from two strata: the marine shell midden, and a non-shell sandy deposit that both overlies the shell midden and borders it on three sides. These strata were observed to interfinger in the excavation units and in the exposed cliff face. This situation, together with the radiocarbon dates obtained from this site, indicates that deposition of both these strata took place at the same time. Evidence of the marine oriented adaptation of the site's prehistoric inhabitants was recovered from both the shell midden and the non-shell sandy deposit. This evidence is significant, as it challenges a current theory that archaeological sites along the coastal margin that lack shell deposits were occupied by peoples with a terrestrially oriented adaptation.

By 2000 years ago, the settlement on Yaquina Head had been abandoned, perhaps as a result of changing conditions at the headland caused by erosional forces. It is possible that occupation shifted at this time to two smaller shell middens (35LNC49 and 35LNC50) situated to the east in the lee of the headland. Analysis of cultural materials recovered during

previous testing by Oregon State University indicates that these sites contain generally similar evidence of occupation, but that occupation of these shell middens occurred after the abandonment of the archaeological site at the tip of Yaquina Head.

PREFACE AND ACKNOWLEDGEMENTS

Archaeological investigations at Yaquina Head were carried out under the terms of Contract No. OR910-CT6-2115 between the Bureau of Land Management, Salem District, and Heritage Research Associates of Eugene, Oregon. Frances M. Philipek served as the BLM Contracting Officer's Representative, while Rick Minor and Kathryn Anne Toepel shared responsibility as Co-Principal Investigators for Heritage Research Associates.

Archaeological fieldwork was conducted between September 3-12, 1986. The field crew employed on this project included the following individuals:

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Albert C. Oetting
Robert Wenger

The discovery of two human burials during the excavations at Yaquina Head prompted the involvement of the Sacred Lands Committee of the Confederated Tribes of Siletz Indians. Committee members George C. Baker (Chairman), Alene Baker, Mary Alice Muncey, and Ishbel Butler visited the site on September 10. In view of the fact that both burials were subject to imminent destruction by erosion, the Sacred Lands Committee asked that the burials be recovered. George and Alene Baker, with committee member Art Bensell, returned to the site on September 12 to observe the removal of the first burial. The committee subsequently agreed to the recovery of the second set of skeletal remains, which were returned for reburial on the Siletz Reservation on September 15. The timely cooperation of the Sacred Lands Committee in regards to the recovery of the human burials from Yaquina Head was greatly appreciated.

It was originally planned that test excavations would also be conducted at 35LNC50, a small shell midden on the north side of Yaquina Head which is partially located on BLM land. Because the Yaquina Head site proved to be more complicated than expected, this testing plan was not implemented. However, artifact and faunal data from this site and another nearby shell midden (35LNC49) recovered by Oregon State University in 1980 have been analyzed and the results included in this report. Permission to reanalyze the cultural materials from 35LNC49 and 35LNC50 by Richard E. Ross and Sandra Snyder, as well as the loan of this collection by Roberta L. Hall of Oregon State University, is gratefully acknowledged.

This report represents the combined efforts of a number of investigators. The bulk of this report was written by Rick Minor, Kathryn Anne Toepel, and Ruth L. Greenspan. Reconstruction of the geomorphology of the site and analysis of the sediments was carried out by Patricia F. McDowell. Debra C. Barner carried out the study of molluscan remains. The fish and mammal bones were studied by Ruth L. Greenspan, and the bird bones were analyzed by Rebecca J. Wigen. Analysis of the human skeletal remains was performed by Brian E. Hemphill. Rick Minor analyzed artifacts for this project, while the lithic debitage was classified by Robert R. Musil.

The vertebrate faunal remains were identified using comparative skeletal material at several institutions. The authors would like to thank the following individuals and institutions for making these reference collections available: Susan Jewett (Department of Ichthyology), and Jim Mead and Don Wilson (Department of Mammals), National Museum of Natural History, Smithsonian Institution, Washington, D.C.; Norma Feinberg and Barbara Brown (Department of Ichthyology), American Museum of Natural History, New York; Condon Museum of Geology, University of Oregon, Eugene; and the Department of Anthropology, University of Victoria, British Columbia.

Final responsibility for production of this report was assumed by Kathryn Anne Toepel. Artifact illustrations were drawn by Allen B. Cox, and maps and stratigraphic profiles were prepared by Jill A. Chappel and Kathryn Anne Toepel. Paul W. Baxter assisted in the statistical analysis of the radiocarbon dates. At the conclusion of this project, the field notes, artifacts, and faunal collections from Yaquina Head were deposited for curation at the Oregon State Museum of Anthropology, University of Oregon, under Accession No. 607.

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CHAPTER 1

INTRODUCTION

This report describes the results of archaeological investigations at Yaquina Head, a prominent headland on the central Oregon coast. This headland is famous for being the location of the tallest active lighthouse along the Oregon coast. The station was built in 1872-1873, and the light first displayed its beacon on August 20, 1873. The lighthouse and an associated residential complex were operated by the U.S. Coast Guard until 1976. Eventually, all residential structures were removed, and the lighthouse became part of the the Yaquina Head Outstanding Natural Area administered by the Secretary of the Interior through the Bureau of Land Management.

A survey of the lighthouse facility at Yaquina Head in 1975 identified two possible archaeological sites, one of which was thought possibly to represent a prehistoric shell midden, located to the north and east of the lighthouse (Cole 1975). Proposed improvements to the parking facilities used by visitors to the lighthouse prompted an evaluation of the archaeological resources on the headland in 1985-1986 (Philipek 1985, 1986a). The existence of an extensive archaeological site on Yaquina Head was confirmed at this time. This site was subsequently determined eligible for inclusion in the National Register of Historic Places based on its potential for contributing significant information concerning Oregon coast prehistory (Philipek 1986b).

In response to an apparent acceleration in the erosion of the site area along the north face of the headland, the Bureau of Land Management sponsored a program of archaeological investigations in 1986 as a means of mitigating the loss of information about prehistoric lifeways contained in this site's cultural deposits (Philipek 1986b). The objectives of these investigations were to recover cultural materials that could be used to determine the age and function of this site and establish its significance in regional prehistory. The procedures and results of the archaeological investigations carried out during this project are described in this report.

LOCATION AND SETTING

Yaquina Head is located 5 km north of the City of Newport, in Lincoln County on the central Oregon coast (Figure 1-1). This prominent headland is situated west of Agate Beach, in the NE-1/4 of Section 30, T10S, R11W, Willamette Meridian. The archaeological site on

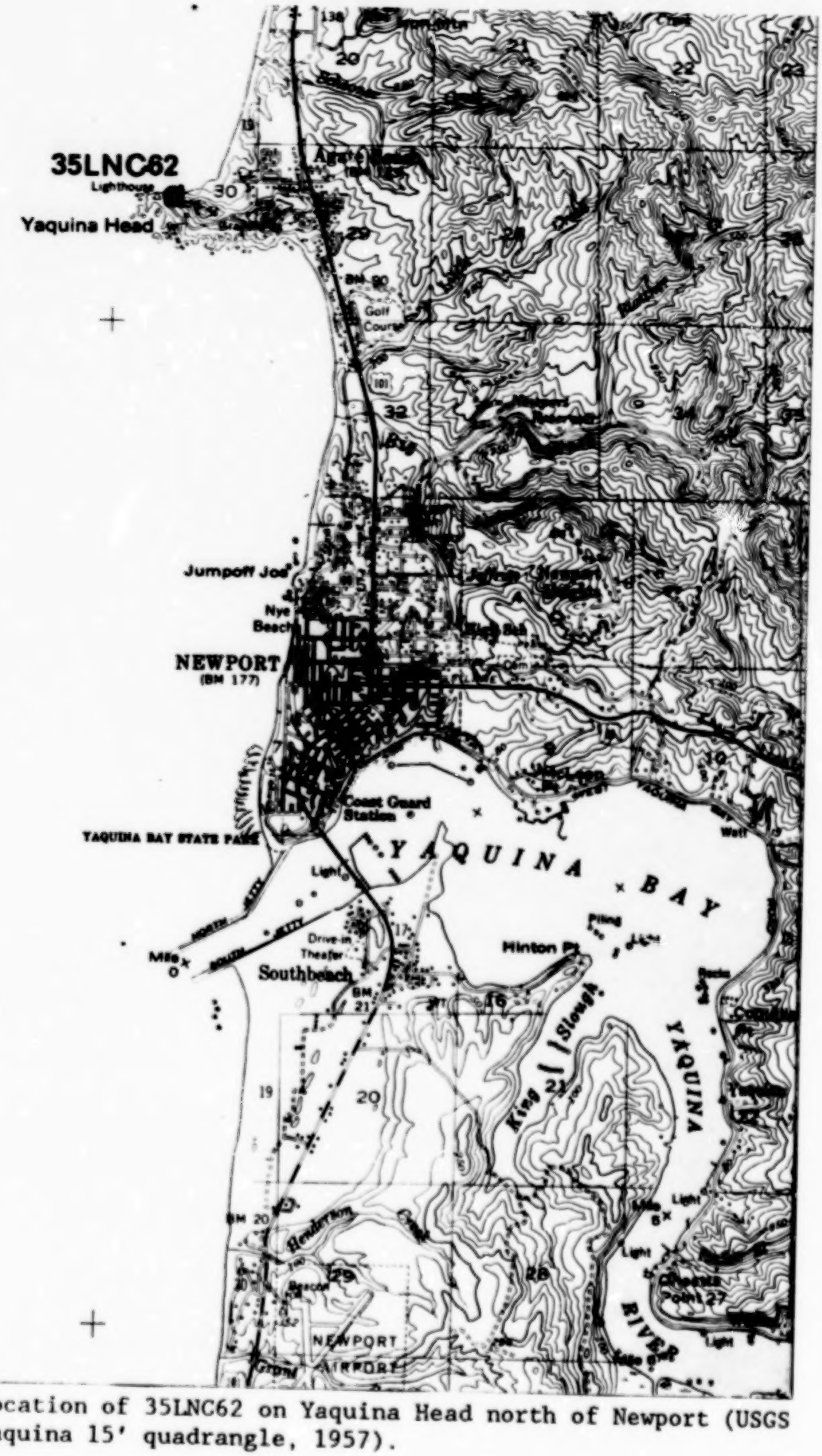

Figure 1-1. Location of 35LNC62 on Yaquina Head north of Newport (USGS Yaquina 15' quadrangle, 1957).

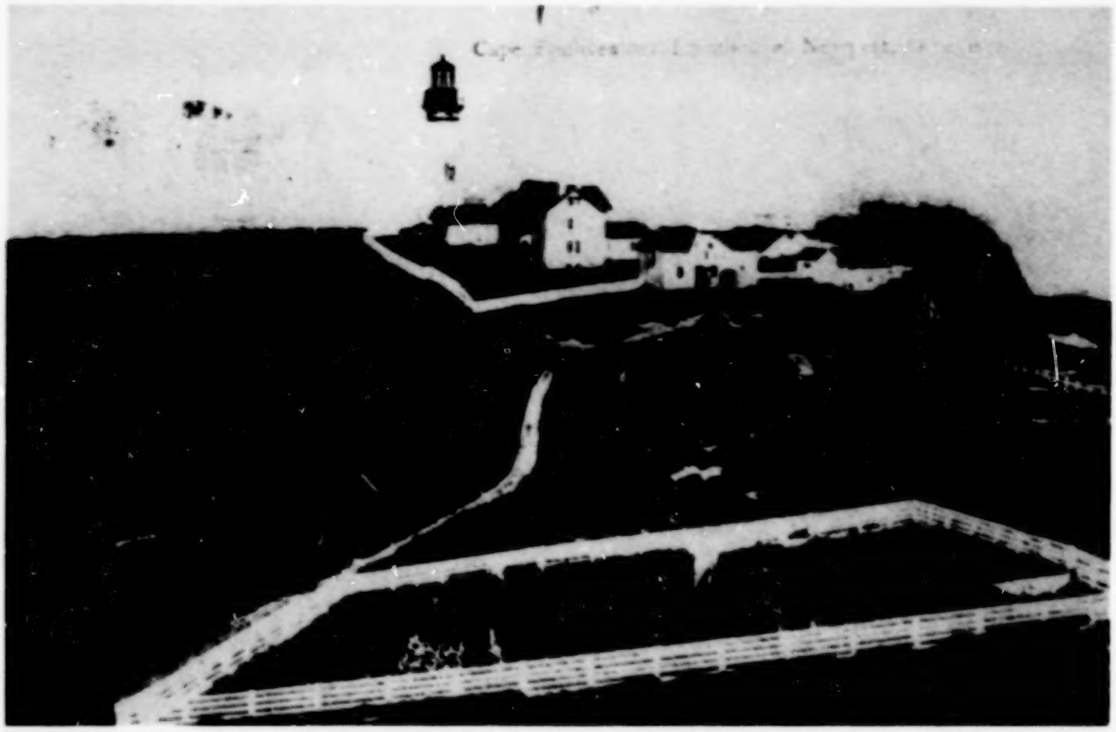

Figure 1-2. View of Yaquina Lighthouse complex prior to 1925 showing a number of structures in the vicinity of 35LNC62 (from the files of the Bureau of Land Management, Salem District).

Yaquina Head is located on the exposed, narrow tip of the headland, with the Pacific Ocean to the north, west, and south. The site, which apparently extends across the top of the headland from the north to the south face, is situated roughly between the lighthouse and the visitors' parking lot.

In conjunction with the building of the lighthouse in 1872-1873, a large three-story keeper's residence and barn were constructed near the base of the lighthouse (Figures 1-2 and 1-3). In 1925, the barn was moved to the east to make room for a second house. The original three-story residence was replaced in 1938 by another house. Both of these structures served as living quarters for lighthouse personnel until a few years ago (Bureau of Land Management 1983:16). A low volume spring, located on the headland approximately 165 m to the east of the site, provided fresh water during the lighthouse occupation, and was presumably used by the prehistoric inhabitants of Yaquina Head as well.

The flora and fauna at Yaquina Head are rich and varied, and for this reason the headland was congressionally designated an Outstanding Natural Area in 1980. The top of the headland around the lighthouse, excluding the portion within the visitors' parking lot, is now covered

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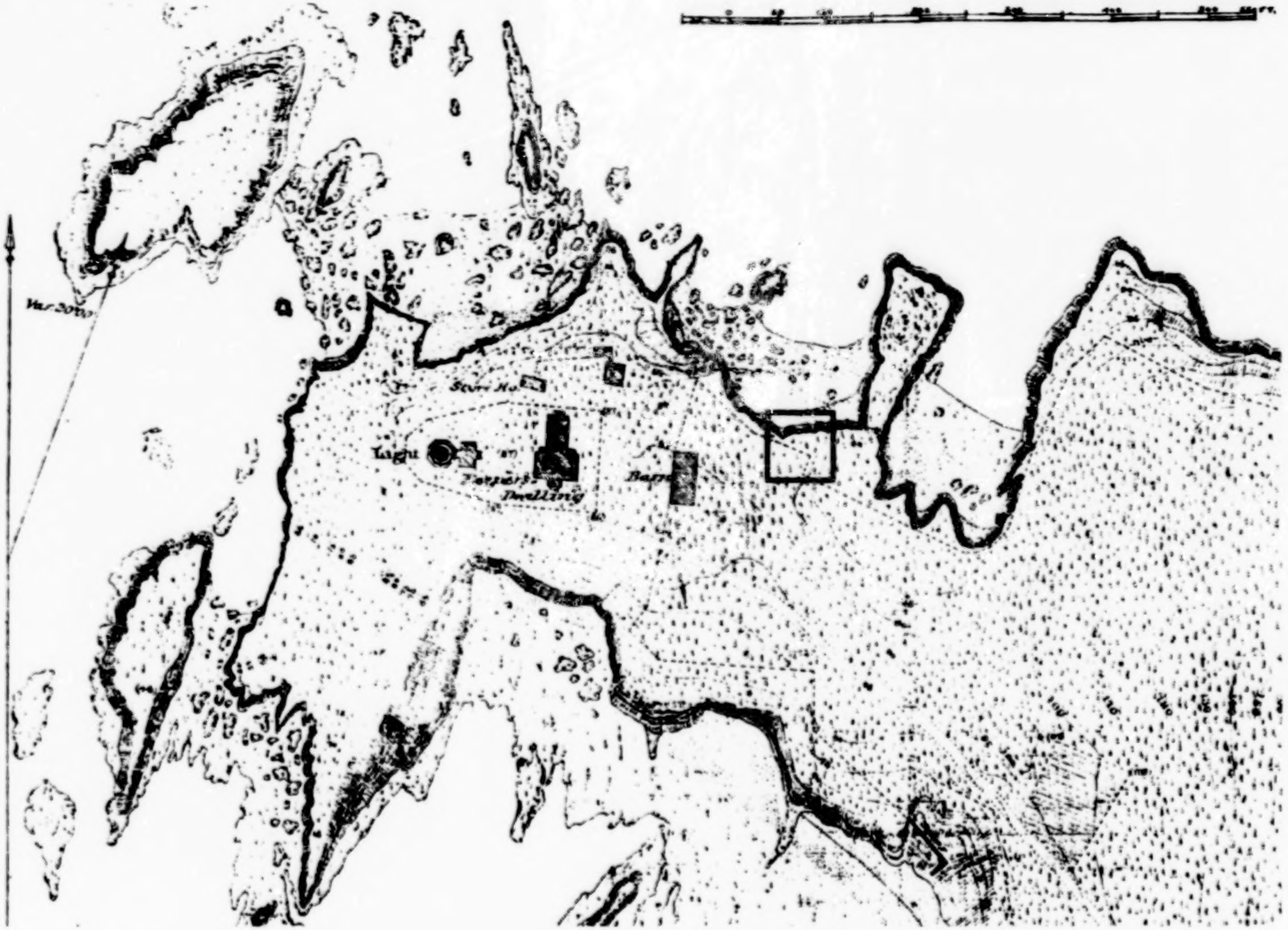


Figure 1-3. 1884 map of Yaquina Head showing the location of the shell midden along the north face of the headland in relation to early lighthouse structures and fences (from Salem BLM files).

by grasses and clover introduced in historic times. Native vegetation still present on the headland includes sitka spruce and lodgepole pine trees, salal, and bracken fern. A variety of other plants are also found on the headland, including three of rare occurrence, Alaska rein orchid, seaside gold-fields, and sea kale (Table 1-1).

A wide range of fauna makes use of Yaquina Head and the surrounding area. The headland is an especially productive habitat for birds, as nine types of birds breed and rear young on the headland, while 37 types of birds use the headland during migratory flights or for wintering (Table 1-2). Harbor seals and sea lions rest on rocks at the base of the headland, and twice a year whales migrate close offshore. Kelp beds in the ocean below the headland support a wide range of nearshore fish, and salmon also pass offshore in the adjacent ocean

Table 1-1. Plant species known to occur within the Yaquina Head Outstanding Natural Area (after Bureau of Land Management 1983).

Shrubs

Nootka or Wild rose
Salal
Twinberry
Himalayan Blackberry*
Evergreen Blackberry
Trailing Blackberry

Trees

Sitka spruce
Lodgepole pine

Ferns

Bracken fern

Other Vascular Plants

False Lily of the Valley
White clover*
Cow parsnip
Seaside tansy
Common thistle
Foxglove*
Pimpernel*
English plantain*
Buckhorn plantain*
Small fireweed
Oregon wild cucumber
Pink sea clover
Dwarf cow parsley
Seaside fleabane
Oxeye daisy*
Monkey flower
Field chickweed
Heal-all*
Plantain
Fireweed
Bitter dock*
Western buttercup
Seaside gold-fields
Blue-eyed grass
Hedge nettle
English daisy*
Yellow mustard*
Cleavers bedstraw
Tiger lily
Evergreen violet
Sea thrift
Rein orchid
Sea kale*
Ladies tresses

* introduced plants

Table 1-2. Birds occurring within the Yaquina Head Outstanding Natural Area (from Bureau of Land Management 1983).

Species	Abundance*	Species	Abundance*
Marine Birds Breeding at Yaquina Head			
Brant's cormorant	C	Common murre	N
Pelagic cormorant	C	Pigeon guillemot	C
Black oystercatcher	U	Rhinoceros auklet	U
Glaucous-winged gull	C	Tufted puffin	U
Western gull	N		
Birds using the Yaquina Head Area during periods of migration and wintering			
Common loon	C	Western sandpiper	O
Arctic loon	U	Red phalarope	I
Red-throated loon	U	Northern phalarope	I
Red-necked grebe	U	Parasitic jaeger	I
Horned grebe	C	Glauous-winged gull	N
Western grebe	N	Western gull	N
Brown pelican	C	Herring gull	X
Double-crested cormorant	C	Bonaparte's gull	C
Brant's cormorant	C	Sabine's gull	I
Pelagic cormorant	C	Herman's gull	O
Harlequin duck	I	Black-legged kittiwake	O
White-winged scoter	N	Common tern	I
Surf scoter	N	Arctic tern	X
Black scoter	C	Common murre	N
Black oystercatcher	U	Marbled murrelet	O
Surfbird	C	Ancient murrelet	I
Black turnstone	N	Cassin's auklet	O
Wandering tattler	U	Rhinoceros auklet	O
Western killdeer	X		

* N - numerous: 50 or more birds/observer/day
C - common: 11-49 birds/observer/day
U - uncommon: 1-10 birds/observer/day
O - occasional: not seen every day, but occurs regularly
I - irregular: abundance and/or occurrence fluctuates annually
X - unknown: too little information to determine abundance

waters. Tide pools at the ocean's edge contain mussels, barnacles, and other molluscs, as well as a variety of additional intertidal species.

ETHNOGRAPHIC INHABITANTS

Yaquina Head is located along a section of the Oregon coast that was occupied at the time of historic contact by the Yaquina Indians. The Yaquina, along with the neighboring Alsea to the south, spoke closely related dialects of a single language, which alone represents the Alsean language family. This language family has in turn been traditionally placed in the Penutian linguistic phylum, suggesting distant linguistic ties with other Penutian speakers, such as the Siuslaw, Lower Umpqua, and Coos peoples to the south along the Oregon coast (Thompson 1973:993-994). Although initially recognized as separate groups, later ethnographers have come to treat the Yaquina and Alsea as a single cultural unit encompassed under the name Alsea (e.g., Barnett 1937; Drucker 1939).

Relatively little information is available about the extent of the territory occupied by the Yaquina and Alsea. Philip Drucker, who conducted ethnographic research on the Siletz Reservation in 1934, was content to simply note that "two short river valleys, the Alsea and the Yaquina, and the ocean frontage between them, comprised the extent of Alsea territory" (Drucker 1939:81). Yaquina territory was somewhat more specifically defined in the information collected for the unratified treaty of 1855, which indicates that this group occupied both sides of the Yaquina River from the coast to the crest of the Coast Range, some 32 km inland (Toepel and Beckham 1982:68-69).

The boundary between the Yaquina and the Alsea was probably in the vicinity of Beaver Creek (Toepel and Beckham 1982:69). Alsea territory then extended farther south along the coast to Tenmile Creek north of present-day Florence. The neighbors of the Yaquina on the north were the Salish-speaking Tillamook. The exact point of southernmost Tillamook settlement is unclear, but it may have been in the vicinity of Otter Rock (Berreman 1937:39).

J. Owen Dorsey, who recorded ethnographic and linguistic information on the Yaquina during a visit to the Siletz Reservation in 1884, compiled a list of 56 named sites, but most have no locational descriptions (Dorsey 1890:229-230). A few of the sites are vaguely located near Elk City and Newport. The native peoples inhabiting the Oregon coast at the time of historic contact resided in winter villages, with a range of less permanent settlements visited during the remainder of the year. It is clear from Dorsey's list, however, that no attempt was made to distinguish between villages, camps, and simple place names (Drucker 1939:82fn). The nature of the annual settlement-subsistence round in the Alsea-Yaquina area of the Oregon coast remains poorly understood at this time.

Reconstructing the culture of the Alsea and Yaquina is of considerable importance because of their pivotal position along the Oregon coast. These peoples were apparently subject to influences from both the core of the Northwest Coast culture area to the north as well as from the more localized climax area centered around the mouth of the Klamath River to the south. The theme of northern versus southern influences runs throughout the anthropological and linguistic studies of the Alsea and Yaquina (for a review of Alsea-Yaquina culture, see Toepel and Beckham 1982:64-88).

PREVIOUS DESCRIPTIONS OF THE YAQUINA HEAD SITE

The archaeological site on Yaquina Head was first identified on May 25, 1975 by David L. Cole, then Curator of Anthropology at the Museum of Natural History, University of Oregon, during the course of a survey of the headland carried out under contract with the U.S. Coast Guard (Cole 1975). Since Cole's impression of the site differs so much from those of later archaeologists, the following summary relies heavily on direct quotes from his report. In a brief review of previous archaeological surveys along the Oregon coast, Cole remarked that:

> ...although shell middens usually indicate the presence of an archaeological site, today this is not always the case. In historic times the middens have been exploited for fill either by land leveling in the immediate vicinity, or transporting the deposits by carrier over greater distances (Cole 1975:3).

During the survey of the Coast Guard property on Yaquina Head, Cole observed

> ...darkened soil zones similar to those caused by human occupation. It is suspected that this phenomenon is the result of brush or forest fires and subsequent leaching, however, it is always possible that indications of human occupation could be discovered at sometime, associated with the dark soils (Cole 1975:3).

Cole specifically noted two areas "that may be archaeological sites" (Cole 1975:4). Site 1 was a shell deposit located northeast of the lighthouse on the north flank of the headland. He noted that this shell deposit

> ...has been covered by a mound of earth that is suspected to be earth that had been moved in the construction of the parking area and roads associated with the light station. Because of indications of earth moving, it is suspected that the shell deposits could have been brought in for fill (Cole 1975:4).

Site 2, located directly east of the lighthouse, was described by Cole as follows:

> In an earth cut at the base of the hill there were a few scattered shells and some firecracked rocks such as may occur near a campfire. Also there were a few chert flakes, that could be attributed to aboriginal tool manufacturing. These materials were discovered toward the center of the disturbed earth cut area. From investigations it was apparent that if this had been a campsite, nothing is left of archaeological value" (Cole 1975:4).

Cole concluded his report with the recommendation that

> ...since there is some question about the source of the shell deposits of Site 1 it is suggested that light station records be searched to see if there is any record of shell being brought in for fill. If the shell was not brought in, the most reasonable explanation is that the area must be an archaeological site [and] so [it] should be recorded... (Cole 1975:4).

The archaeological site on Yaquina Head was officially recorded with the Oregon Archaeological Survey as 35LNC62 as a result of an inspection and evaluation of the site by BLM archaeologist Frances M. Philipek in August-September, 1985 (Philipek 1985, 1986a). The main shell deposits observed earlier by Cole along the north side of the headland were relocated and described as "a dense layer of midden material characterized by marine shellfish remains, fire cracked rock, charcoal, mammal, bird and fish bone, antler, and lithic flakes" (Philipek 1986a). This midden deposit was exposed along the eroding north face of the headland, where it was observed to range "from a few inches to approximately 12 inches in width." The top of the shell midden exposed along the north face was situated "from a short depth below the surface to a depth of greater than one foot" (Philipek 1986a).

From the shell midden exposed in the north face, evidence of occupation was observed to extend across the top of the headland to the south face. Small shell fragments are exposed on the ground surface over portions of this area, which has been graded for use as a parking lot. Excavation of post holes for a parking barricade encountered two shell layers below the ground surface. The first layer of shell, two to seven inches thick, was found at a depth of seven to nine inches below surface. The top of a second layer of shell, which measures 17 inches thick at three locations, was found at a depth of 18 inches below surface. The lower shell layer also contained sea mammal bones, fire cracked rock, pieces of charcoal, and basalt flakes (Philipek 1986a).

Finally, smaller, apparently isolated shell midden deposits were also noted at two other locations on the headland. The first location was on the north face of the headland at the base of the observation deck below the lighthouse. This location was approximately 60 m west of the densest exposure of shell along the north face. The second isolated shell deposit was visible on a foot trail down to the tide pools below the south face of the headland. It was suggested that these two isolated exposures may have been related to the shallow upper shell layer encountered during the post hole excavations in the parking lot (Philipek 1986a).

In addition to the shell deposits, cultural materials observed and/or collected from the site included fire-cracked rock, animal bones, a large antler (possibly elk) fragment, an antler wedge, a bone wedge, a possible bone perforator, and chert and basalt flakes. It was also noted that artifacts have reportedly been found by visitors among the rocks below the eroding north face of the headland (Philipek 1985).

In summary, during the initial survey of Yaquina Head, Cole had observed two possible archaeological sites: Site 1, a possible shell midden on the north face of the headland, and Site 2, a possible campsite situated to the east in a dune area cut through by road construction. In contrast, Philipek observed not only these two areas but also two additional shell deposits, one on the north face and the other on the south face of the headland. A sufficient amount of shell fragments and lithic remains were exposed on the ground surface between these various areas to indicate that they likely are all part of one, very extensive, archaeological site.

SCOPE OF PRESENT PROJECT

In any event, it was clear by the time that archaeological investigations were conducted in September, 1986, that the total area occupied by cultural deposits is considerably larger than initially suggested by the 1975 survey. As originally proposed by the Bureau of Land Management, archaeological investigations in 1986 were to be concentrated along the eroding north face of the headland, where the shell deposits were deepest and most extensive (Figure 1-4). In addition, some testing was to be carried out in the areas of the two smaller shell deposits, the one on the north face near the lighthouse, and the other on the south face near the foot trail to the tide pools.

Finally, it was requested that data from 35LNC50, a small shell midden located east of 35LNC62 on the north side of Yaquina Head and previously tested by Oregon State University (Snyder and Ross 1980), also be included for comparative purposes. Acquisition of data from this site would involve analysis of the artifact and faunal collection obtained during the original testing and further investigations of the part of the site situated on lands administered by the Bureau of Land Management.

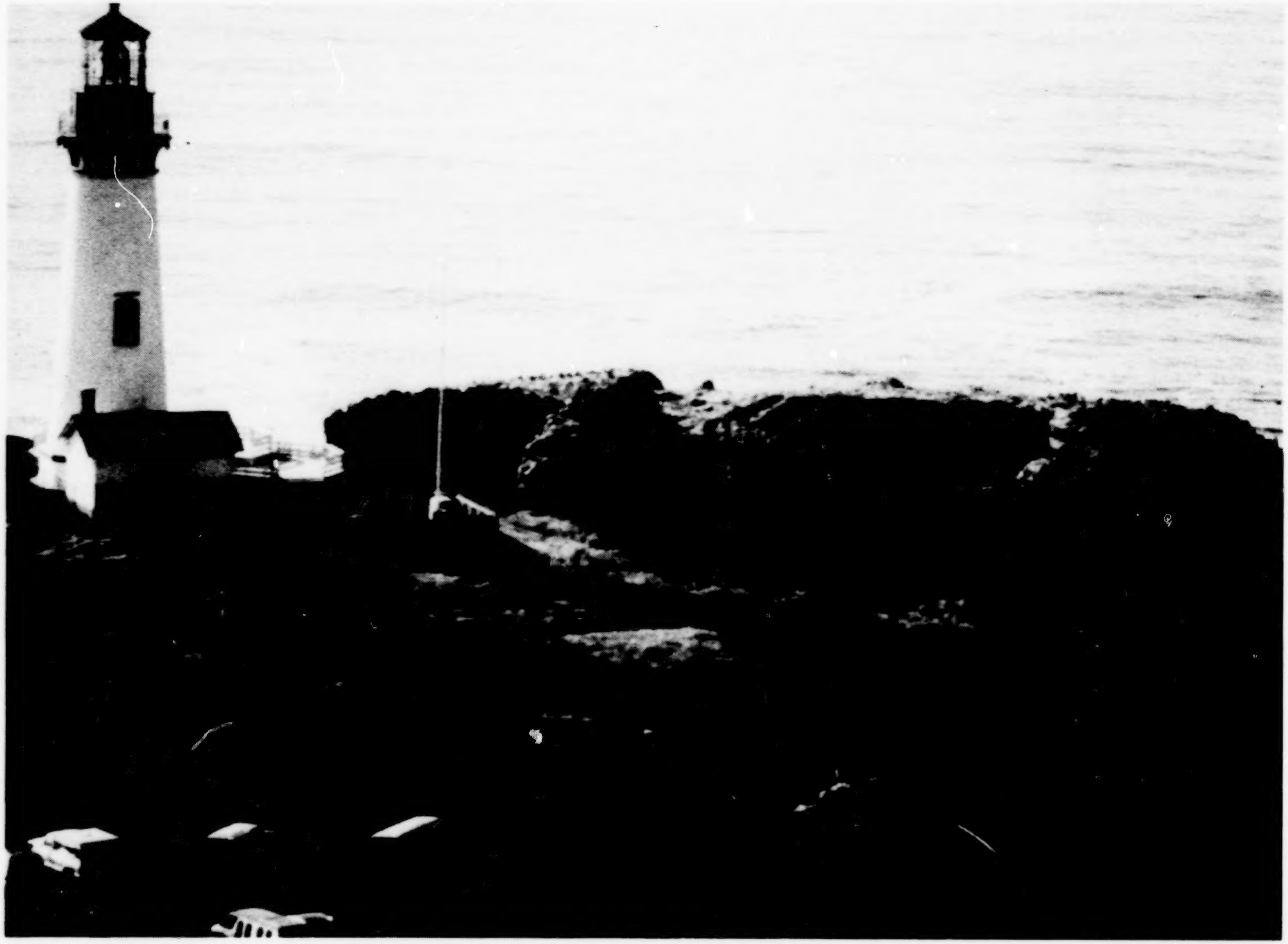


Figure 1-4. View to the west of Yaquina Head with excavations in progress at the main midden (visible in the lower right corner).

As work proceeded along the headland's north face, it became apparent that the cultural deposits in that area were more complex than originally thought. Specifically, a cultural stratum containing a high density of artifacts was found to overlay the shell midden. In addition, while the shell midden in this area was originally estimated to be only about 30 cm thick, excavations soon established that the midden was considerably thicker, with the total depth of the cultural deposits averaging 120 cm.

Accordingly, rather than distributing the excavations to include all three shell deposits on the headland, it was decided to concentrate the fieldwork solely in the north face area where destruction of the cultural deposits by erosion is most active. Plans for additional work at 35LNC50 were also abandoned, but the artifact and faunal collections from the previous testing of this site and another nearby shell midden (35LNC49) by Oregon State University were borrowed and analyzed. Although the Yaquina Head site and the shell middens on the north side of the headland do not appear to have been occupied contemporaneously, analysis and publication of the cultural materials from these settlements represents a useful addition to the comparative data base pertaining to prehistoric occupation along the Oregon coast.

CHAPTER 2

GEOMORPHOLOGY OF THE YAQUINA HEAD SITE

by Patricia F. McDowell

Yaquina Head is one of the more prominent headlands along the Oregon coast, reaching a maximum elevation of 80.3 m above sea level. To the south of the headland Agate Beach extends 5 km to Yaquina Bay at the mouth of the Yaquina River, while to the north Beverly Beach extends 7.6 km to Otter Rock (Dicken, Johannessen, and Hanneson 1976: 49-50).

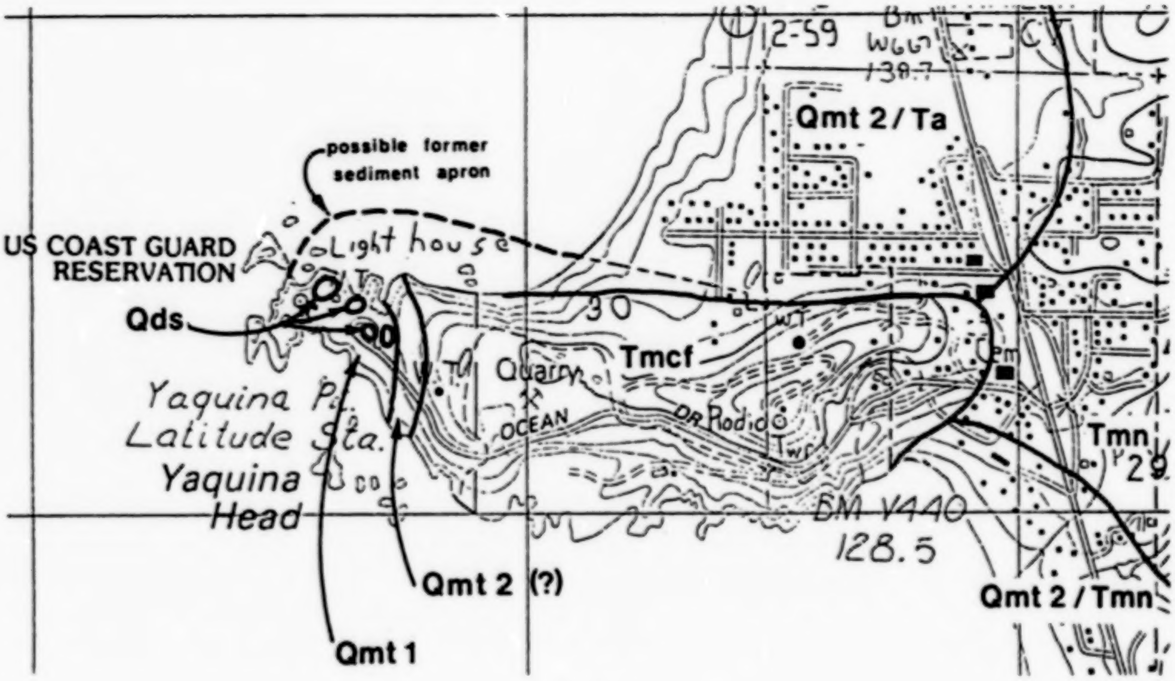
DESCRIPTION

Yaquina Head was formed by an intrusive mass of Cape Foulweather basalt of middle Miocene age (*Tmcf* in Figure 2-1). This intrusive basalt mass is surrounded by the weaker sedimentary rock (sandstones, siltstones, and conglomerates) of the Astoria Formation (*Ta*) and Nye Mudstone (*Tmn*) formed during the early Miocene. Erosion has exposed the harder basalt as a prominent coastal headland (Schlicker and others 1973; Snavely, MacLeod and Wagner 1973).

The western tip of the headland, on which the archaeological site is situated, is a fairly level surface about 23-27 m above sea level. This surface is an uplifted marine terrace formed during a period of higher sea level, probably during the early Wisconsin or Sangamon periods which are estimated to date between 80,000 to 125,000 years BP (Adams 1984; McDowell 1987).

Several small rounded knolls, which represent old stabilized dunes, occupy the surface of this marine terrace (except where obliterated during lighthouse construction). Formation of these dunes (*Qds*) apparently dates from before the time the site was occupied by prehistoric peoples. The dunes are now mantled by a more recent layer of eolian sand. The recent eolian sand is probably less than 3000 years old, based on radiocarbon dates from the underlying archaeological deposits.

The stratigraphy of the terrace consists of an abrasion platform cut into the basalt, overlain by >3 m of unconsolidated marine terrace deposits. The marine terrace deposits, examined in excavation Unit B (Table 2-1), consist of a well-sorted fine and very fine sand layer



KEY

Qds:	*dune sand, stabilized (Holocene)*
Qmt1:	*low marine terrace (Pleistocene)*
Qmt2:	*high marine terrace (Pleistocene)*
Tmcf:	*Cape Foulweather basalt (Miocene)*
Tmn:	*Nye mudstone (Miocene)*
Ta:	*Astoria formation (Miocene)*

Figure 2-1. Geomorphic map of Yaquina Head and vicinity.

(beach or near-shore marine deposits), overlain by a fine sandy loam layer with soil development at the top. The archaeological deposits occur at and within the top of this soil. A layer of eolian sand overlies the soil and archaeological deposits in the eastern area of the terrace surface.

The stratigraphy observed in Units G and H was slightly different from that described above in Unit B. The uppermost deposits in these units--Strata 1, 2A, and 2B--conformed to the sequence observed in Unit B. Underneath the shell layer, however, was a deposit similar in texture and color to the sediments in Stratum 1 above the shell. Because it occurred below the shell, this deposit was referred to in the field as Stratum 3. Subsequent laboratory analysis suggests that this deposit may in fact be a continuation of Stratum 1 under the

Table 2-1. Soil profile description, west wall of Unit B.

Stratum	Depth	Description
1	0-21 cm	Black (10YR 2/1 moist) loamy fine sand; dark brown (10YR 3/2) dry; moderate, medium-fine crumb structure; very friable; common grass roots; some shell fragments (<1 cm) and few pebbles; neutral (pH 7.2); clear, smooth lower boundary.
1	21-57 cm	Black (10YR 2/1 moist) loamy fine sand; dark gray (10YR 4/1) dry; weak, medium angular blocky structure; friable to slightly hard; few fine grass roots; few shell fragments and pebbles; neutral (pH 7.2); abrupt, wavy to irregular lower boundary, due to digging and infilling into underlying layer (by human disturbance and rodents).
2A	57-67 cm	Shell layer with a little black, organic rich matrix; layer is very dense, dominated by large shells (2 cm up to 4 cm); mildly alkaline (pH 7.6).
2B	67-102 cm	Shell layer, supported by black, organic-rich matrix; smaller, more decayed shells than in overlying layer; very few roots; mildly alkaline (pH 7.8); abrupt, wavy to irregular layer boundary.
3	102-112 cm	Dark yellowish-brown (10YR 3/4 moist) sandy loam; yellowish-brown (10YR 5/4) dry; weak, medium subangular blocky structure; friable; no shell; very few roots; contains common gravel-sized (commonly 2 cm, up to 11 cm) lumps of orange cemented sand; moderately alkaline (pH 7.9); clear to gradual lower boundary.
4	112-170 cm	Lighter yellowish-brown sandy loam; structure and consistence as above; common gravel-sized clasts; no shell; bottom of excavation unit at 130 cm; augering indicates this deposit continues downward to 170 cm; mildly alkaline (ph 7.8).
5	170-181 cm	Dark yellowish-brown (10YR 3/6 moist) fine sand; yellowish-brown (10YR 5/5) dry; firm and brittle; mildly alkaline (ph 7.6).

shell. This idea is supported by the color classification and pH values of sediment samples obtained from Unit G (Table 2-2), as well as by profile drawings from this area of the site (see Chapter 3). This deposit, in turn, occurred above a lighter, yellowish brown sandy loam, designated in the field as Stratum 4, which was similar to Stratum 3 underlying the shell in Unit B.

To the east of the archaeological site, the land surface rises toward a hill which forms the top of the basalt headland. At the western base of this hill is a gently sloping bench which stands about 15 m above the level of the site and about 42 m above sea level. An auger hole located one meter north of a National Ocean Survey marker installed in 1986 was excavated into this bench. Table 2-2 presents data on the sediments encountered in this auger hole, which serve to characterize the deposits on the marine terrace away from the archaeological site. The results of this auger testing indicate that the ground surface is underlain by >5 m of eolian and marine terrace deposits (*Qmt2?*). This situation suggests that this bench may be an older marine terrace.

INTERPRETATION

Marine terraces formed of nearshore and beach deposits and capped by eolian dunes are common along the Oregon coast (Cooper 1958). These features are landscape remnants of the coastal environment that existed during previous high sea level periods (interglacial periods of the Pleistocene), and they have been uplifted to their present positions above sea level by tectonic forces (McDowell 1987). Eolian deposits in the form of sand dunes and sand sheets are derived from wind erosion from the beach zone, and they generally lie just windward of, and at a level about the same or slightly higher than their source beach.

At Yaquina Head, the beach and nearshore deposits are overlain by two generations of eolian deposits. These eolian deposits are somewhat unusual, in that they are presently perched on a high headland and are not connected to a source beach. The position of these eolian sands suggests that, during the period of sand deposition, a sand source was located under the northern or southern flank of the headland. Driven by the strong winds which sweep this exposed headland, climbing dunes or sand sheets could have blown up a ramp or apron and accumulated on the lower terrace.

Under present conditions, with near-vertical rock cliffs on the headland, sand transport from the beach level to the terrace above is unlikely. The presence of the eolian mantle on the terrace strongly suggests that in the past the cliffs were buried under a sloping apron of deposits that led down to the water level. The absence of a sand apron at this location at the present time can be accounted for by the

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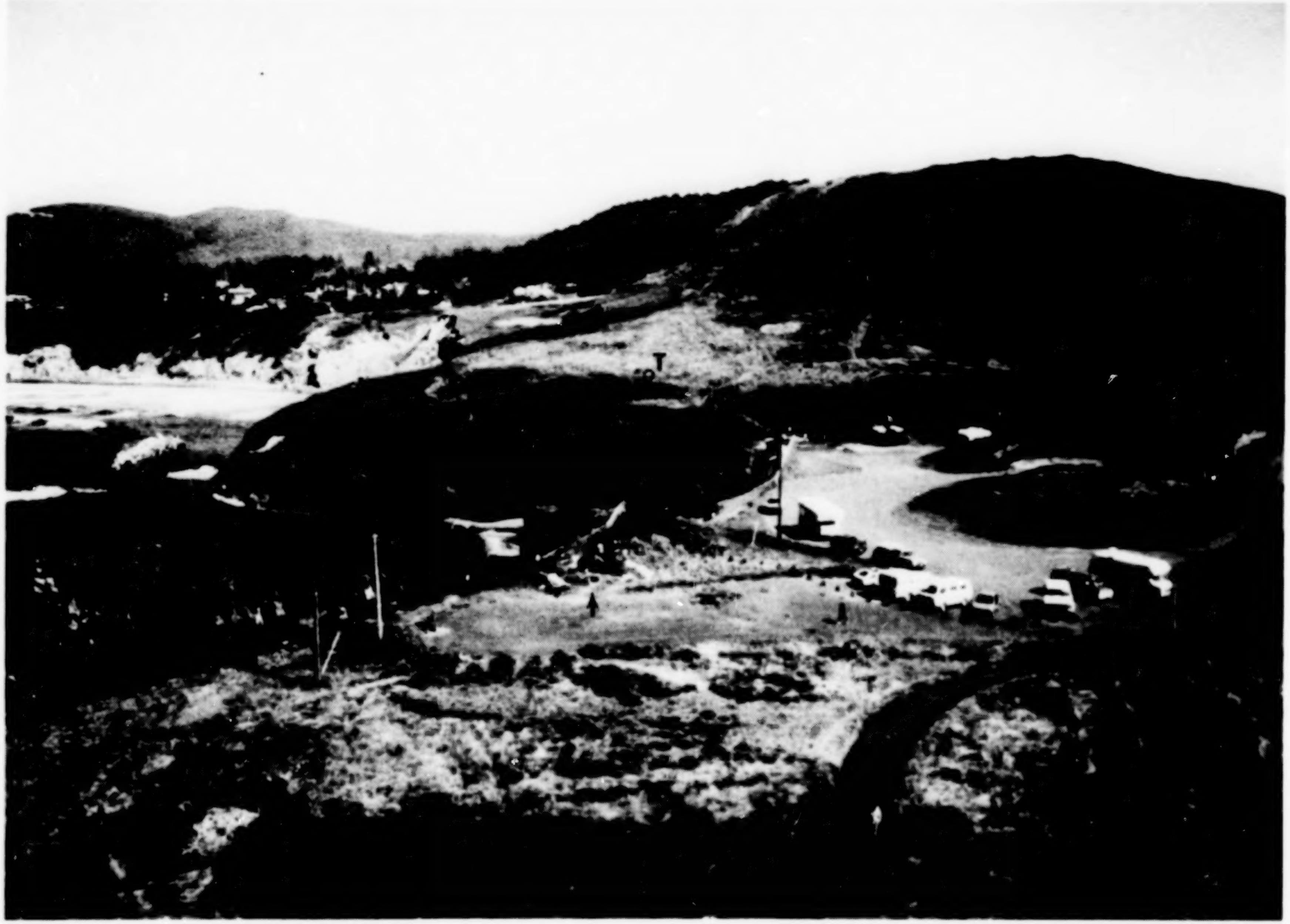


Figure 2-2. View to the northeast of the site area at Yaquina Head (arrows point to areas of excavation; "T" indicates the location of terrace auger hole).

Table 2-2. Color and pH of samples from 35LNC62.

Location	Depth/Stratum	Moist Color	Dry Color	pH
Unit G	Stratum 1	10YR 2/1	10YR 3/2	6.8
	Stratum 2A	10YR 2/1	10YR 4/1	7.6
	Stratum 2B	10YR 2/1	10YR 4/1	7.8
	Stratum 3	10YR 2/1	10YR 3/2	7.9
	Stratum 4	10YR 2/2	10YR 4/3	7.6
Auger Hole on High Terrace:				
T-1	10-20 cm	10YR 2/1	10YR 2.5/2	5.0
T-2	50-60 cm	10YR 2/1	10YR 3/2	5.3
T-3	100-110 cm	10YR 2/1	10YR 3/3	5.2
T-4	130-140 cm	10YR 2/2	10YR 4/3.5	5.3
T-5	140-150 cm	10YR 2/2	10YR 4/4	5.2
T-6	190-200 cm	10YR 3/4	10YR 5/4	4.8
T-7	240-250 cm	10YR 3/5	10YR 5/4	4.7
T-8	290-300 cm	10YR 3/6	10YR 5/4	4.7
T-9	340-350 cm	10YR 3/6	10YR 5.5/4	4.9
T-10	390-400 cm	10YR 5.5/4	10YR 5/4	5.0
T-11	410-420 cm	2.5Y 4/4	2.5Y 5.5/2	5.2
T-12	460-470 cm	2.5Y 3.5/2	2.5Y 5/2	5.4
T-13	490-500 cm	2.5Y 4/2	2.5Y 5/4	5.5

postglacial rise in sea level, which would have resulted in its destruction by erosion and wave action.

The sand apron could have been located on the northern or southern flank of the headland, or both. On the Oregon coast, eolian sand transport is south to north during the winter and north to south during the summer (Cooper 1958). At Yaquina Head, a sand apron on the south edge of the headland would have supplied sand to the low terrace surface during the winter, while a sand apron on the north edge would have supplied sand during the summer. In many Oregon coastal dune fields, small migrating dunes are most active during the summer (Cooper 1958), but the net annual sand transport is dominated by winter south-to-north transport (Hunter, Richmond and Alpha 1983). The south edge of the headland is subject to the erosive force of strong winter storm waves from the southwest, so a sediment apron would be more likely to persist on the protected northern edge of the headland. The idea of a sediment apron from water level to the lower terrace surface on the north edge of the headland during prehistoric times is supported by the memory of a Native American informant, who recalled that when she was a child more than 50 years ago it was possible to climb down a steep path on the north side of the headland to the ocean below.

PREHISTORIC LANDSCAPE OF YAQUINA HEAD

At the time of prehistoric occupation at the archaeological site, sea level was at or slightly below its present level (McDowell 1986). The probable level of relative sea level was -10 m or less at 5000 BP, -4 m or less at 3000 BP, and -1 m or less at 1000 BP. Thus the archaeological site was not at or near the beach level at the time of occupation. If the hypothesized existence of a sediment apron from the lower terrace to near the beach level is correct, however, the beach was much more accessible from the site in prehistoric times. The most likely position for this apron was on the north flank of the headland, although there may also have been an apron on the south flank as well. A subsequent rise in sea level since the time of the prehistoric occupation has resulted in the removal of the apron through erosion and wave action.

Erosion may also have reduced the area of Yaquina Head during the last 3000 years. Erosional reduction of Yaquina Head since the time of occupation is difficult to estimate because little accurate data exist on sea cliff erosion rates. Modern rates of erosional retreat along the coast are slow (probably <1-10 cm/year) on basalt, and moderate to fast (probably <1 m/year) on Quaternary sediments (McDowell 1987). The latter figure indicates that a substantial width of sediment apron could have been removed since the time of prehistoric occupation. On the north flank of the headland, archaeological material is presently exposed in the bare eroding cliff. At the time of occupation, the site undoubtedly extended north of its present boundary at the cliff.

CHAPTER 3

EXCAVATIONS, STRATIGRAPHY AND DATING

Archaeological investigations at Yaquina Head in 1986 were conducted adjacent to the north face of the headland, where the thick shell midden deposit previously observed by Cole (1975) and Philipek (1985, 1986a) was being actively destroyed by erosion. The headland's north face, in the area where excavations were conducted, consists of a nearly vertical cliff that drops more than 25 m to a rocky shoreline and the waves and surf of the Pacific Ocean below. Erosion had exposed a thick shell deposit along the top of this cliff face.

Two excavation techniques were employed during the fieldwork: (1) auger testing, and (2) unit excavations. The two techniques were carried out concurrently, with the results of the auger testing used to locate the excavation units. The locations of the excavated auger holes and excavation units are shown on the topographic site map (Figure 3-1). All excavations were backfilled at the conclusion of the fieldwork.

AUGER TESTING

The auger testing program was carried out primarily for the purpose of establishing the distribution of shell deposits inland from the north cliff face. Thirteen auger holes were excavated in this area. These were spaced at 10 m intervals east to west, and 5 m intervals north to south (see Figure 3-1). The auger holes were excavated using a heavy-duty auger with a 25-cm bore. Excavations were conducted in arbitrary 10 cm levels, with the soil matrix passed through 3-mm (1/8-inch) mesh screen. Data generated during the auger testing program is appended to this report.

A summary of the auger hole data (Table 3-1) indicates that the cultural deposit back from the face of the headland ranges from 100 cm to as much as 230 cm in depth. The main shell deposit appears to extend more than 30 m along the cliff face and approximately 15 m north-south back from the cliff (Figure 3-1). For the most part, however, the cultural deposit encountered in the auger holes consisted of the non-shell deposit designated Stratum 1 during the unit excavations. Dense shell midden was encountered only in auger holes 1C (from 40-110 cm), 1E (from 100 and 190 cm), 2E (from 100-140 cm), and 3E (from 80-115 cm).

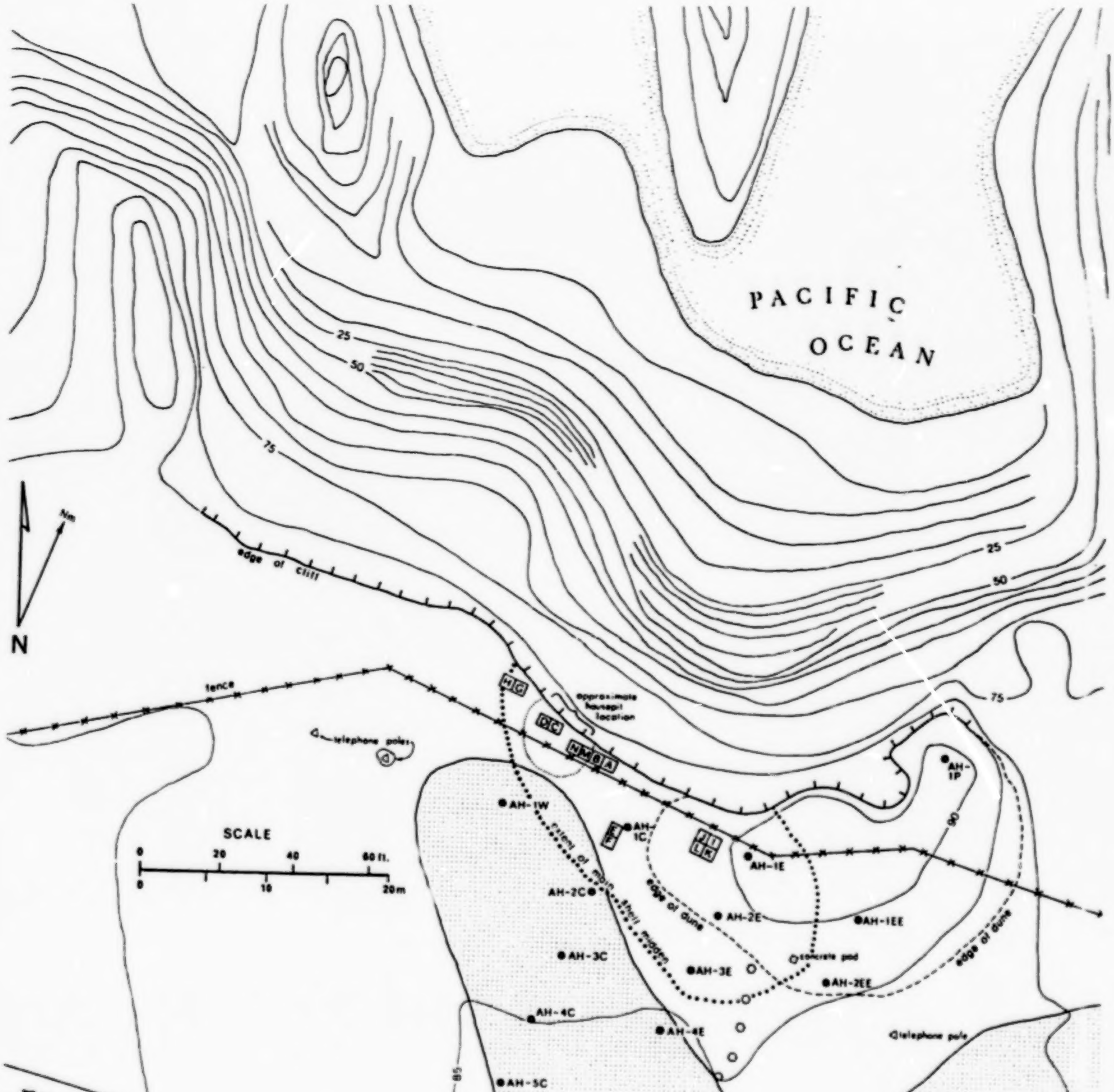


Figure 3-1. Topographic map of Yaquina Head showing locations of auger holes, excavation units, and approximate extent of shell midden.

Table 3-1. Summary of auger testing results at Yaquina Head.

Auger Hole Number	Depth of Cultural Deposit Below Surface	Maximum Depth Reached Below Surface
1W	0-120 cm	170 cm
1C	0-150 cm	185 cm
2C	0-140 cm	157 cm
3C	0-140 cm	160 cm
4C	20-110 cm	180 cm
5C	20-150 cm	168 cm
6C	0-100 cm	150 cm
1E	70-230 cm	240 cm
2E	60-160 cm	170 cm
3E	40-130 cm	140 cm
4E	20-120 cm	130 cm
1EE	60-160 cm	180 cm
2EE	40-150 cm	160 cm

This situation indicates, of course, that there is considerably more to the archaeological site on Yaquina Head than just the shell midden. An extensive occupation, with shell only sporadically represented, occurred around the midden areas. Judging from the dark organic-rich nature of the sediments and the occasional finding of artifacts on the ground surface, it appears that this non-shell occupation extended more or less across the entire surface of the headland.

One more auger hole (designated 1P) was excavated on the point to the northeast of the main excavation area. Dark sediments similar to those designated Stratum 1 in the unit excavations are exposed in the face of the headland on this point. Excavation of this auger hole encountered light brown dune sand to a depth of 100 cm, with the darker Stratum 1 sediments occuring to 250 cm. Charcoal and fire-cracked rock were recovered from the auger hole. The results of this excavation indicate, then, that a deep cultural deposit, lacking in shell, also occurs to the north and east of the shell midden exposed in the north face of the headland.

UNIT EXCAVATIONS

As a means of horizontal control, unit excavations at Yaquina Head were carried out within 1 m squares. Vertical control was maintained through use of line levels attached to fixed stations, the elevations of which were correlated by means of the transit and stadia method. The cultural deposit was removed with shovels and trowels in 10 cm levels, subdivided according to natural stratigraphy.

Artifacts encountered in situ were recorded on sketch maps on excavation forms prepared for each unit/level/stratum. Otherwise, recovery of cultural materials was accomplished by dry-screening the soil matrix through 3-mm (1/8-inch) mesh. All cultural materials recovered were bagged separately according to the unit, level, and stratum from which they originated. In all, the excavation units encompassed a 14 m^2 area. All units were dug to the limits of the cultural deposit, with a total volume of 20.1 m^3 of fill removed during the unit excavations.

Since a principal objective of the archaeological investigations was to recover information from portions of the site immediately threatened by erosion, a majority of the excavation units were placed in a narrow area between a chain link fence and the eroding cliff face. Two 1 x 2 m units, situated 3 m apart, were initially set up in this area. These units were designated A/B (on the east) and C/D (on the west). Excavations in these units proved to be productive, and work on this side of the fence was later expanded. A 1 x 2 m unit, designated G/H, was placed 2 m west of Units C/D. Another 1 x 2 m unit, designated M/N, was added on the west end of A/B, forming a 1 x 4 m trench (Figure 3-1).

Because fierce winds, generally rising in the afternoons, often made work along the cliff face hazardous, a second series of excavation units was set up in a more protected setting in back (south) of the chain link fence. A 1 x 2 m unit designated E/F was placed next to Auger Hole 1C, in which a fairly thick shell stratum had been encountered.

All of the units so far mentioned, including those on both sides of the chain link fence, were placed on level ground that apparently had been created by the bulldozing of sand dune deposits in connection with construction of the lighthouse residential complex. In order to get some idea of the extent of the cultural remains that might have been removed by this bulldozing, the final four excavation units were placed on top of a remnant dune approximately 4 m east of Units E/F. These excavations were carried out in a 2 x 2 m block comprised of Units I/J/K/L (Figure 3-1).

DESCRIPTION OF THE DEPOSITS

Three basic cultural strata were recognized during the archaeological investigations on Yaquina Head (Figures 3-2, 3-3 and 3-4). As designated in the field, these were (1) Stratum 1, a dark sandy silt

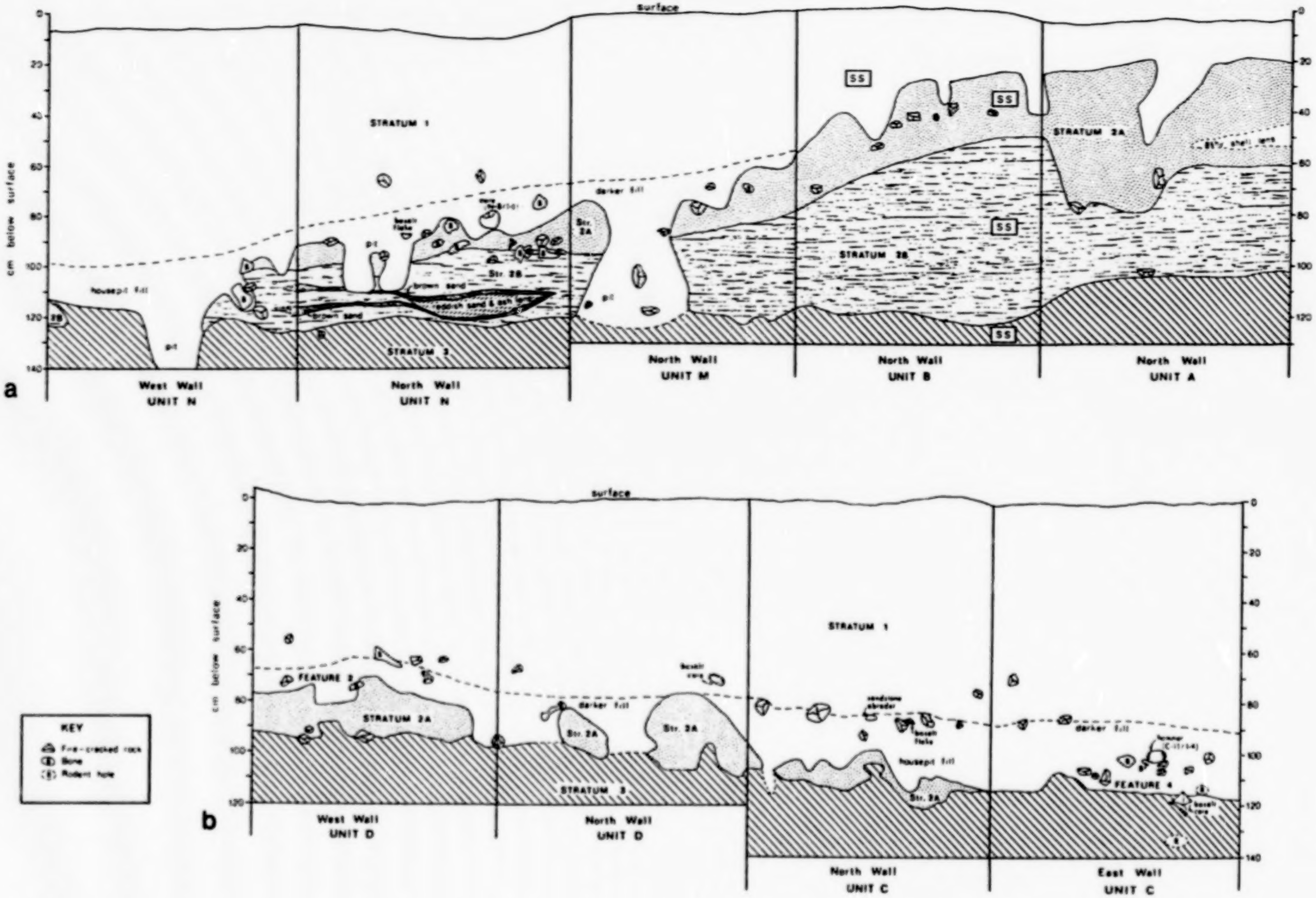


Figure 3-2. Profiles of the north wall and adjacent walls of Units A/B/M/N (a) and C/D (b) along the cliff edge.

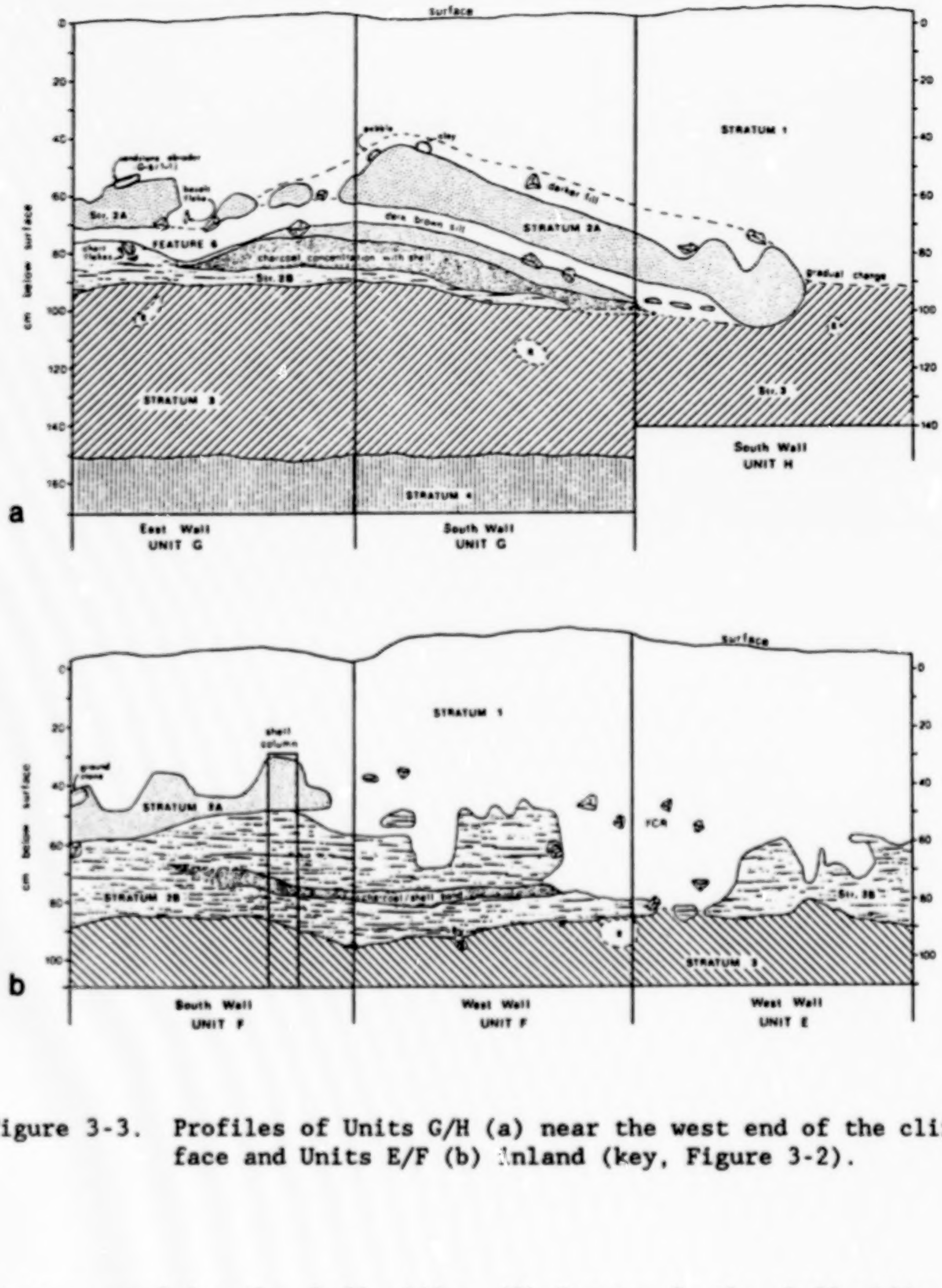


Figure 3-3. Profiles of Units G/H (a) near the west end of the cliff face and Units E/F (b) inland (key, Figure 3-2).

stratum overlying the shell midden; (2) Stratum 2, the shell midden itself; and (3) Stratum 3, a lighter-colored sand underlying the shell midden. A soil profile in the west wall of Unit B was described by Patricia F. McDowell during the course of her geomorphological investigations (see Table 2-1). This was the only unit in which excavations had been completed at the time of her visit.

As excavations progressed, however, it was discovered that the shell midden did not occur quite so uniformly in some of the other units. In some locations, particularly Units G/H and I/J/K/L, the shell deposit was not always continuous, and it was also considerably thinner. In most units it was also possible to further divide the shell deposit, using the designations Stratum 2A and Stratum 2B.

In addition, field descriptions of the Stratum 3 sediments, plus subsequent sediment analyses, suggest that the matrix designated Stratum 3 may, in fact, encompass more than one deposit. Specifically, in Units G/H and C/D, fill designated Stratum 3 was somewhat different in color and texture from the Stratum 3 originally encountered in Units A/B. Examination of the profile of the south wall of Units G/H (Figure 3-3a), as well as the general profile of the north bank of the headland (Figure 3-10) suggests that in some portions of the site Stratum 1 deposits extend below the shell layer designated Stratum 2. It now appears probable that in Units G/H and C/D the fill assigned to Stratum 3 in the field was actually Stratum 1 and Stratum 3 mixed.

The variable distribution of the strata identified at the site is amply illustrated in selected wall profiles (Figures 3-2, 3-3 and 3-4). Basic descriptive data on the strata, based on samples collected by the geomorphologist and from the south wall of Unit G, are presented in Table 3-2 (also see Table 2-1).

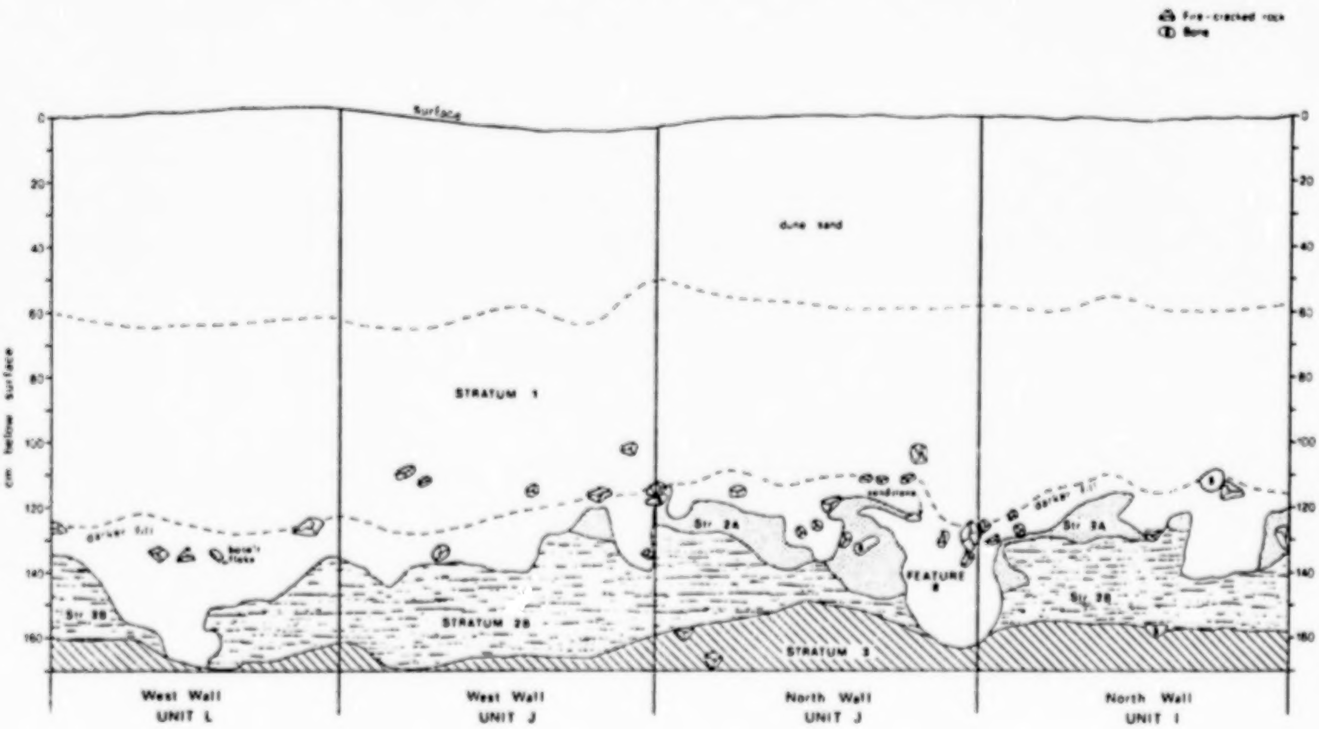


Figure 3-4. North and west wall profile of Units I/J/K/L in the dune area.

Table 3-2. Summary of stratigraphy at the Yaquina Head site.*

Stratum	Cultural Significance	Laboratory Description
0	Sterile eolian sand overlying the cultural deposit	0.5-1.0 m thick layer of very dark brown (10YR 2/2 moist) loamy fine sand; weak soil structure; fine roots; medium acid (pH 5.4-6.1).
1	Cultural stratum overlying shell midden; probably of eolian origin	Black loamy fine sand (typically 10YR 2/1 moist, 10YR 3/2 dry), darker than Stratum 0; moderate to weak soil structure; very friable; neutral pH.
2A	Upper shell deposit	Shell layer dominated by large, broken and whole shell fragments with a little fine black organic-rich matrix; mildly alkaline (ph 7.6).
2B	Lower shell deposit	Shell layer dominated by smaller, more broken or decayed shell fragments than in Stratum 2A; fine, black, organic-rich matrix; mildly alkaline (pH 7.8).
3	Cultural stratum underlying shell midden; eolian sand from dune on marine terrace	Black to dark yellowish-brown sandy loam; weak soil structure; friable; moderately alkaline (pH 7.9); equivalent to B horizon of soil.
4	Sterile eolian sand (?) underlying cultural deposits	Dark brown sandy loam; color grades from very dark brown (10YR 2/2 moist) near the top to dark yellowish-brown (10YR 3/4 moist) at depth; weak soil structure in upper part; friable; mildly alkaline (pH 7.6-7.8); equivalent to lower B or C horizon soil.
5	Sterile eolian or beach sand (?) underlying cultural deposits	Strong yellowish-brown (10YR 3/6 moist) loamy sand; firm and brittle; mildly alkaline (pH 7.6).

* cf. Table 2-1; depths of strata vary across site.

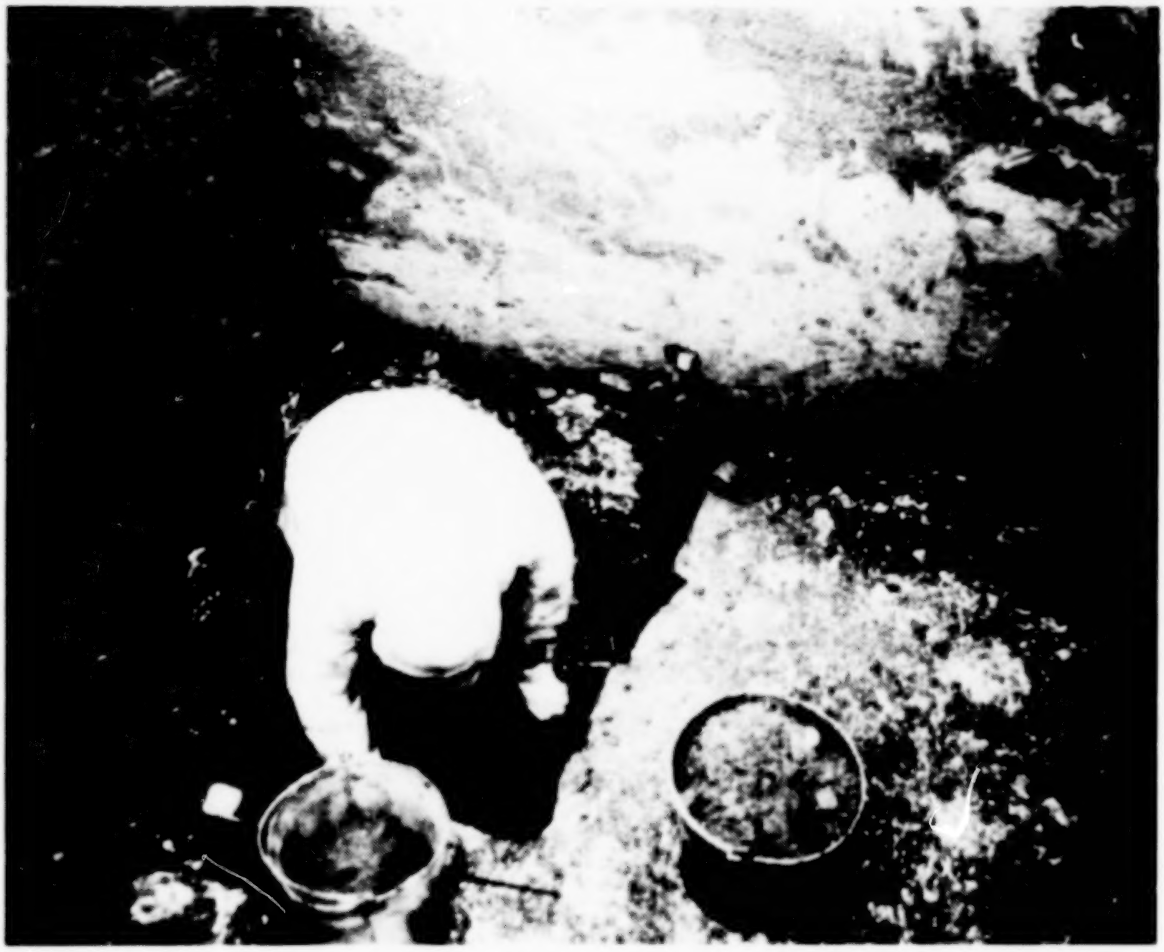


Figure 3-5. Excavations in progress in Unit J, showing dune sand and Stratum 1 overlying the shell midden (Stratum 2); note darker band of Stratum 1 sediments overlying the shell.

CULTURAL FEATURES

Eleven discrete cultural features were encountered and recorded during the excavations. Nine of these features consisted of fire-cracked rock with associated artifacts and faunal remains. These features apparently represent the remains of campfires, hearths, and/or activity areas at the site. Eight of these nine features were situated at interfaces between the non-shell sand deposit (Stratum 1) and the shell midden (Stratum 2). The remaining two features were human burials. Information on these features is summarized in Table 3-3, with more detailed descriptions presented below.

Feature 1 was a fire-cracked rock cluster found at a depth of 40-45 cm (the upper half of Level 5) in Unit F. This cluster was clearly associated with Stratum 1, although two small pockets of shell were present on the southern margin of the unit. The shell midden covered a much more extensive portion of Unit F in the level below the feature. Eight flakes and twelve pounds of fire-cracked rock were removed from this cluster.

Feature 2 was a fire-cracked rock cluster found at a depth of 60-70 cm (Level 7) in Unit D. This cluster was also associated with the Stratum 1 deposit, although again a small shell pocket protruded up from the level below in which the shell midden first covered an extensive portion of the unit. Four flakes were directly associated with this cluster, and nine pounds of fire-cracked rock were removed from the unit/level in which this feature was found.

Feature 3 was a cluster of fire-cracked rocks and associated artifacts found at a depth of 90-100 cm (Level 10). The feature was centered on the boundary between Units C and D. This cluster was resting on and within Stratum 1, although pockets of shell were present in the

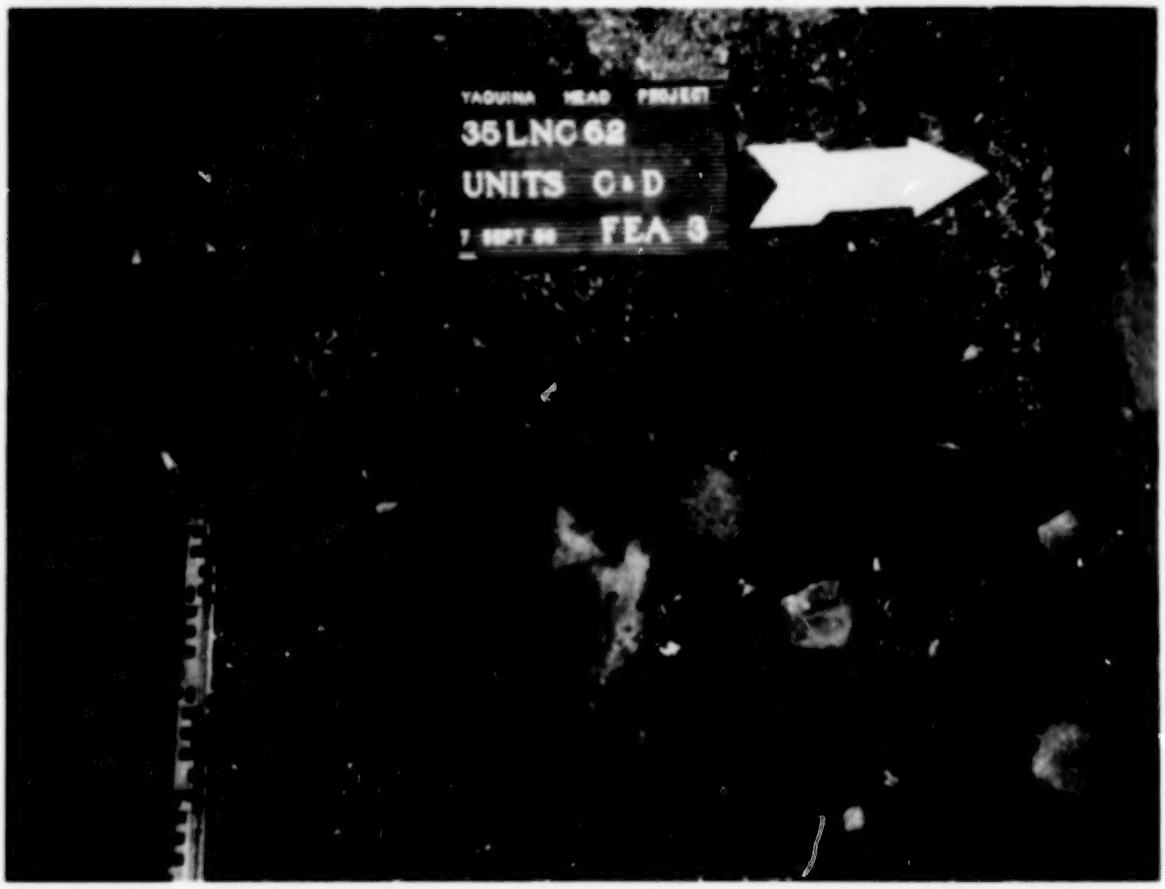


Figure 3-6. View of a hearth and associated artifacts (Feature 3) located in a pit dug into the shell midden in Units C/D.

Table 3-3. Summary of cultural features at Yaquina Head.

Feature Number	Unit	Depth Below Surface	Stratum	Description/Associations
1	F	40-45 cm	1	Fire-cracked rock cluster; 8 flakes, C-14 date of 2930 ± 90 BP
2	D	60-70 cm	1	Fire-cracked rock cluster; 4 flakes
3	C-D	90-100 cm	1	Fire-cracked rock cluster; 1 chopper, 2 sandstone abraders, 3 flakes, 2 unident. large mammal bones, 1 fish (hake) bone
4	C	100-110 cm	1	Fire-cracked rock cluster; 1 biface fragment, 2 sandstone abraders, 22 flakes, 7 unident. large mammal bones, 3 unident. bones
5	C	110-120 cm	1/3	Human Burial #1; whale bone artifact; C-14 date of 3400 ± 240 BP
6	G	70-80 cm	1	Fire-cracked rock cluster; 1 sandstone abrader, 13 flakes, 2 whale bones, 1 unident. large mammal bone, 6 unident. bones, C-14 date of 2310 ± 60 BP
7	H	100-110 cm	1	Fire-cracked rock cluster; 1 chert core, 1 adult female Steller sea lion bone, 1 deer bone, 1 whale bone, 3 large mammal bones
8	I-J	120-130 cm	1	Fire-cracked rock cluster; 1 antler wedge, 1 sandstone abrader, 8 flakes, 2 unident. bones
9	I	150-160 cm	3	Fire-cracked rock in association with sand-filled pit; C-14 date of 3740 ± 110 BP
10	N	80-90 cm	2B	Fire-cracked rock cluster; 1 flake, elk and deer bones, 1 sea lion bone, 1 dog or coyote bone, 1 whale bone, and 34 unident. large mammal bone; C-14 date of 3110 ± 100 BP
11	C*	110-120 cm	1/3	Human Burial #2

* Recovered from cliff face immediately north of Unit C.

center and in the southwest corner of Units C/D (Figure 3-6). This feature contained less than 2 pounds of fire-cracked rock, but associated with this cluster were a chopper, two sandstone abraders, three flakes, two unidentified large mammal bones, and one fish (hake) bone.

Feature 4 was a cluster of fire-cracked rocks found at a depth of 100-110 cm (Level 11) in Unit C. The cluster was situated in the southeast corner of the unit, and was clearly separate from Feature 3. Feature 4 occurred in Stratum 1, although this cluster was situated in a distinctly softer and darker sediment at the base of the stratum in what was later determined to be a housepit (Figure 3-7). Six pounds of fire-cracked rock were removed from this cluster. One biface fragment, two sandstone abraders, 22 flakes, seven unidentified large mammal bones, and three other unidentified bones were recovered in direct association with this feature.

Feature 5 was a human burial found in Unit C. An unusual bone artifact was first encountered at a depth of 110 cm below surface in this unit. This artifact consisted of a flat piece of whale bone with

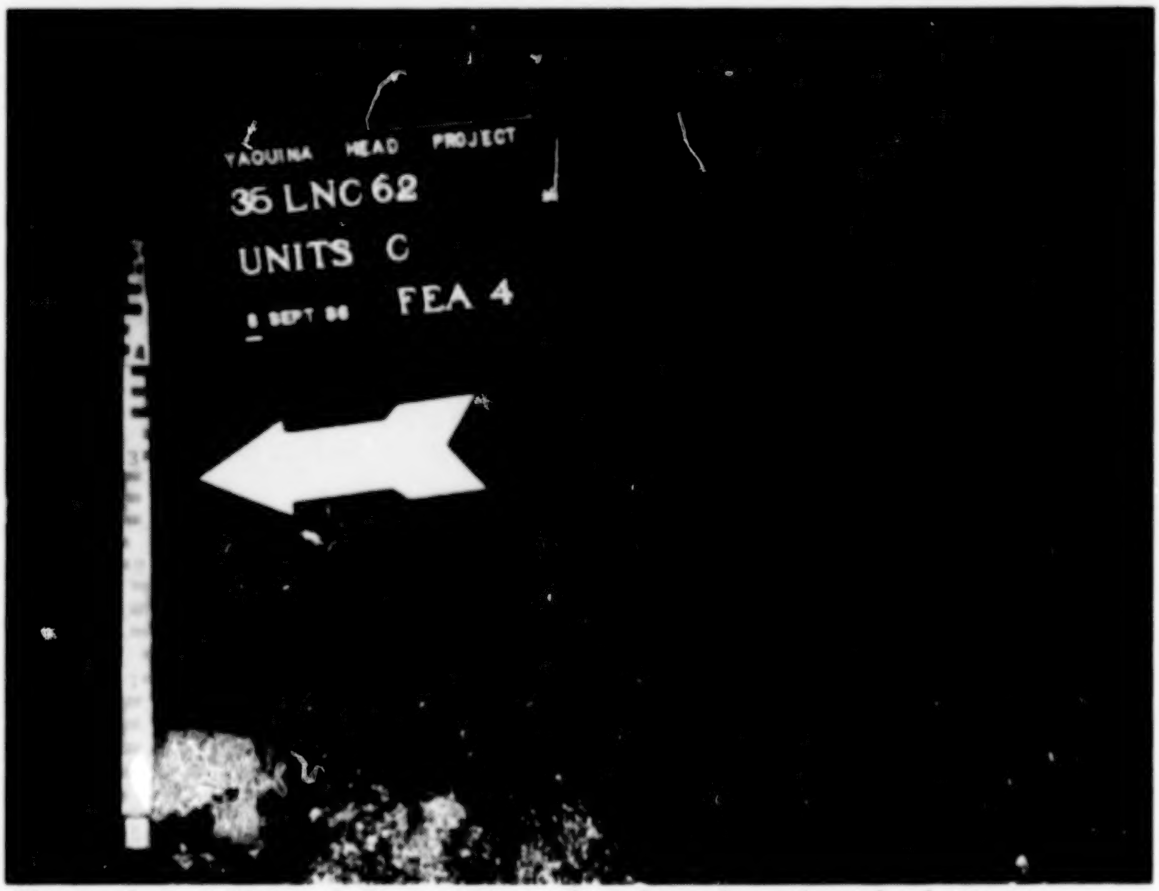


Figure 3-7. View of Feature 4, a fire hearth and tool cluster, situated above Feature 5 in Unit C.

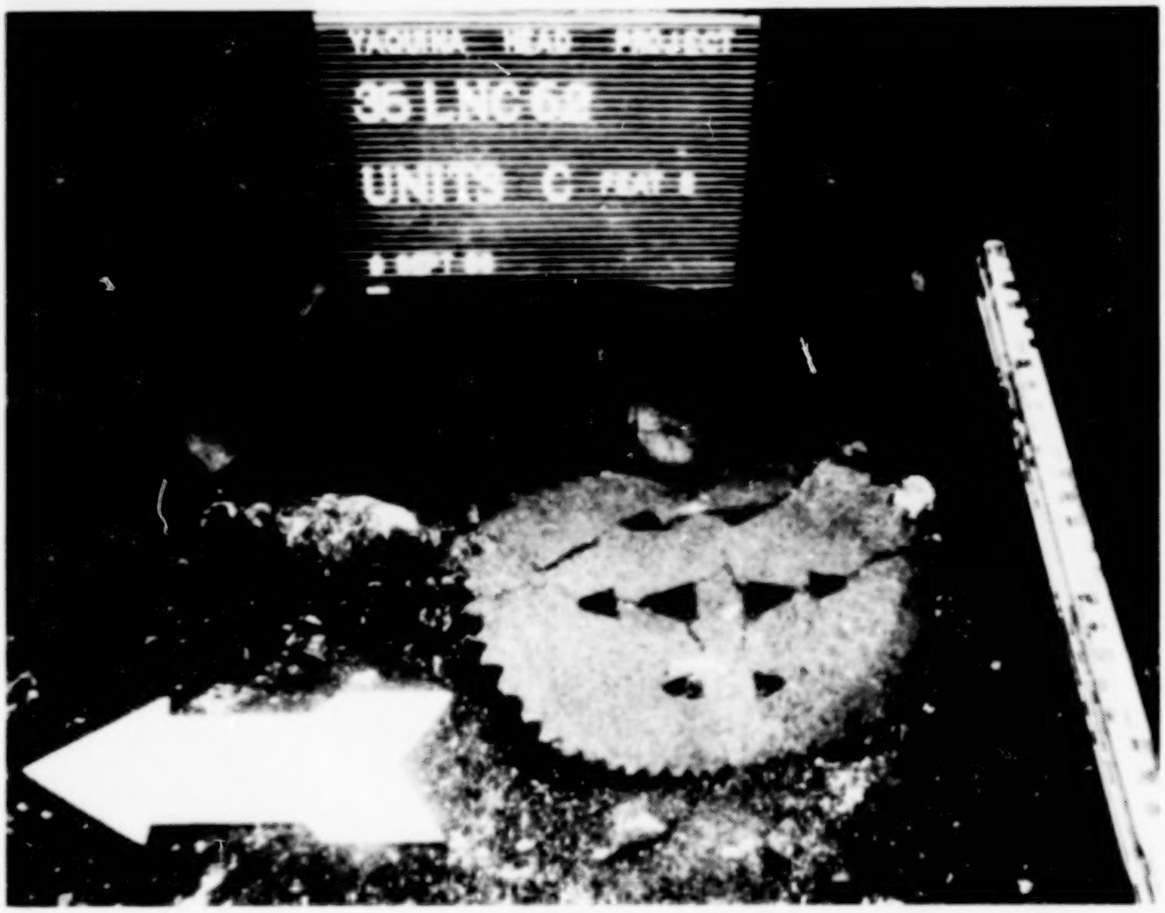


Figure 3-8. View to the east of Feature 5 in Unit C with rock from Feature 4 visible in the sidewall.

scalloped edges and eight triangles cut into its flat face (Figure 3-8). A fragment of this platter-like artifact was submitted for radiocarbon analysis, producing a date of 3400 ± 240 radiocarbon years (Beta-17941). Under this artifact, the partial skeleton of a newborn infant was found. The infant was buried in a shallow pit, the bottom of which was situated 120 cm below the present ground surface.

The stratum association of this burial was obscured by its occurrence within a housepit. This feature appears to have originated in Stratum 1, and it was situated immediately below Feature 4 near the contact between the housepit fill and Stratum 3; shell was present along one margin of the burial pit. This burial, as well as another designated Feature 11, are described in more detail in Chapter 6.

Feature 6 was a cluster of large mammal bones, artifacts, and fire-cracked rock found at a depth of 70-80 cm (Level 8) in Unit G. This cluster of cultural materials occurred within Stratum 1, with the first indications of shell lying below the bone. The four fire-cracked rocks found in this feature weighed only 2-1/2 pounds. One sandstone abrader, 13 flakes, two whale bones, one unidentified large mammal bone, and six unidentified bones were recovered in association with this feature.

Feature 7 was a cluster of vertebrate faunal remains encountered in a 50 x 50 cm area in the west half of Unit H at a depth of 100-110 cm (Level 11). One chert core and six fire-cracked rocks were recovered in association with this feature, which included 4 pounds of fire-cracked rock. The feature was surrounded by Stratum 1 sediments, but it occurred at the edge of shell deposits which occupied the east half of the unit. Faunal remains associated with this feature included one bone from an adult female Steller sea lion, one whale bone, one deer bone, and three unidentified large mammal bones.

Feature 8 was a cluster of fire-cracked rock found at a depth of 120-130 cm (Level 13) at the junction of Units I and J. The rocks were clustered within a small, irregularly shaped pit measuring about 40 x

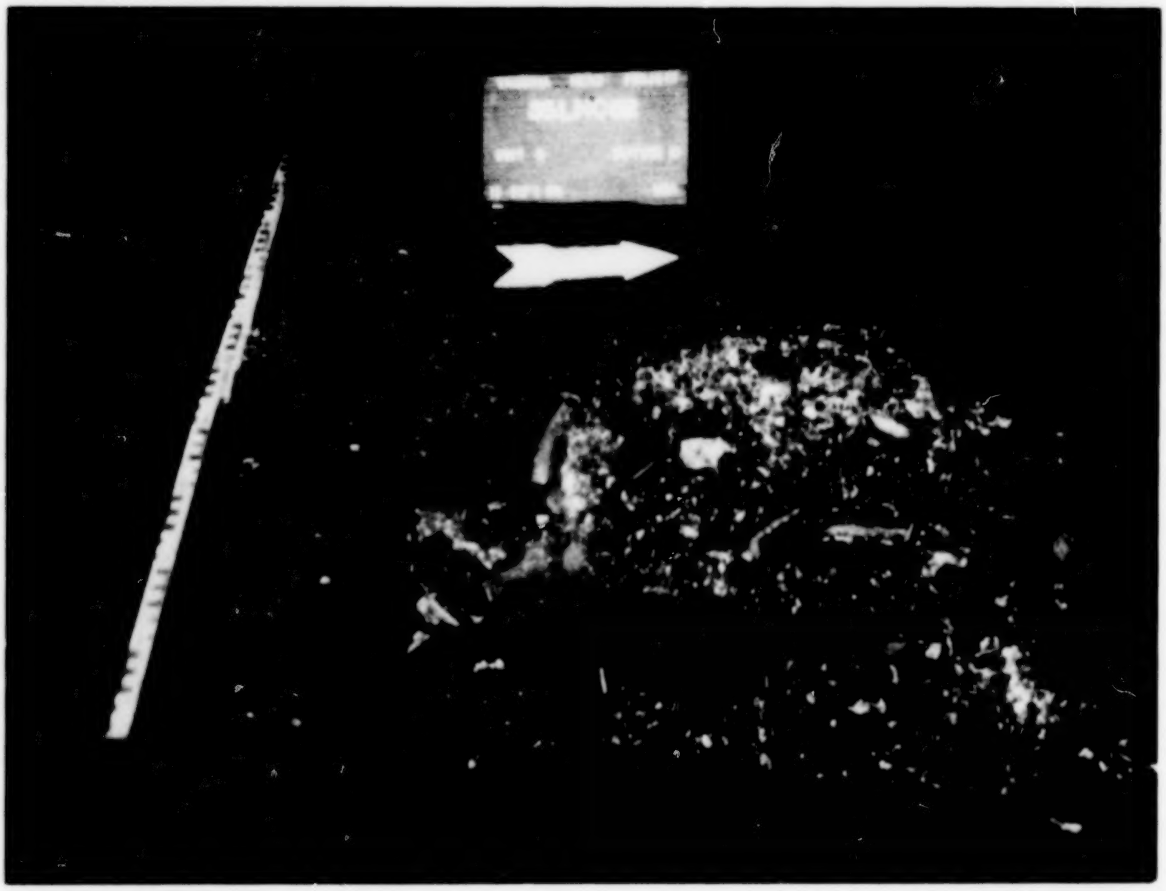


Figure 3-9. View to the west of Feature 10, a fire hearth and bone cluster in Unit N.

40 cm, which appeared to represent a hearth or oven. The rock within this feature weighed 7 pounds. The fill within the pit consisted of Stratum 1 sediments, but a large mammal bone protruded into this feature from the adjacent shell deposits. One antler wedge, one sandstone abrader, eight flakes, and two unidentified bones were recovered in association with this feature.

Feature 9 was a small, sand-filled pit with associated fire-cracked rock found at a depth of 150-160 cm (Level 16) along the east wall of Unit I. The sand within the pit appeared to consist of Stratum 3 sediments, but the pit was surrounded by the shell deposit of Stratum 2. This feature, which appeared to be a campfire within a small pit, contained 2 pounds of fire-cracked rock. Charcoal from this feature produced a date of 3740 ± 110 radiocarbon years (Beta-19832).

Feature 10 was a concentration of fire-cracked rock and large mammal bones found at a depth of 80-90 cm in Unit N (Figure 3-9). Included in this feature were fragments of at least two elk antlers, one elk bone, two deer teeth, one deer bone, one sea lion bone, one dog or coyote bone, one bone of a similar-sized carnivore, 34 other unidentified large mammal bones, one whale bone, and one additional unidentified bone. The bones were situated at the contact between Strata 1 and 2. A few more large bones were recovered in the level below this feature in Stratum 2 deposits. A single large basalt flake and eight pounds of fire-cracked rock were recovered from the level in which this feature was primarily concentrated. Charcoal from this feature produced a date of 3110 ± 100 radiocarbon years (Beta-19829).

Feature 11 was the second human burial found at the site. It was discovered near the conclusion of the field session during the process of drawing a profile of the strata exposed in the cliff face. This second burial was situated about 1.5 m directly north of the first burial found in Unit C, and at approximately the same level (110-120 cm). Wall profiles indicate that this burial had been placed in a pit dug through the shell levels and into the underlying Stratum 3 sediments. The skeleton was that of an adult male. Further information on this burial is presented in Chapter 6.

HOUSEPIT FEATURE

With the completion of the excavation units along the cliff face down to sterile soil, profiling of the exposed strata was begun. In conjunction with this work, it was decided that it was also desirable to obtain a profile of the strata exposed in the cliff face. This was accomplished by outfitting one of the archaeologists with climbing gear and lowering him over the side of the cliff. While scraping down the cliff face with a trowel to improve the definition of the strata, two cultural features were exposed. The first feature, the skeleton of the adult male designated Feature 11, was described above.

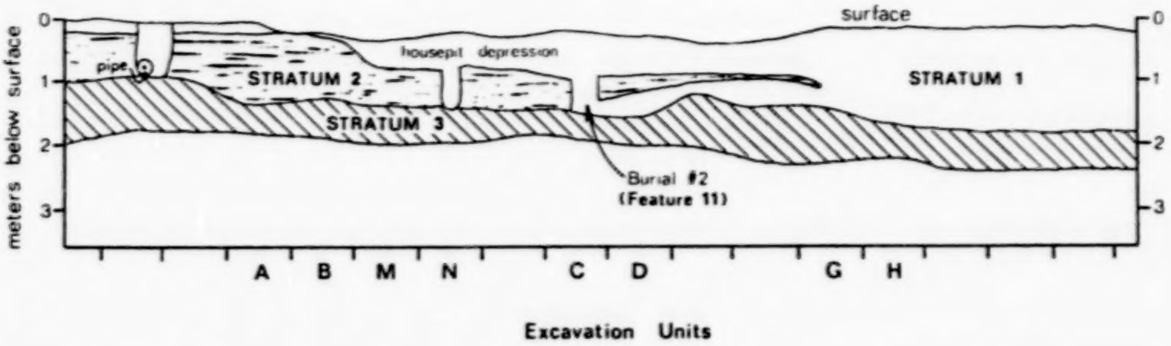


Figure 3-10. Simplified profile of the cliff face north of the excavations showing a housepit profile in Units M/N and C/D (scale in meters).

The second cultural feature exposed in the cliff face was the outline of a semisubterranean housepit (Figure 3-10). This feature was delineated in the cliff face by the absence of shell. Upon tracing this feature in the cliff face, it was found to extend along the cliff face opposite excavation units M/N and C/D. The distinctive sloping east wall of the housepit was visible at the junction of Units B and M. The west wall was not distinct, and apparently ended somewhere in the unexcavated interval between Units D and G. The house outline was also distinctly visible in the south wall profile of Units A/B/M/N (Figure 3-11).

The location of this housepit outline indicates that Units C/D and M/N were situated inside this structure (Figure 3-1). This situation,

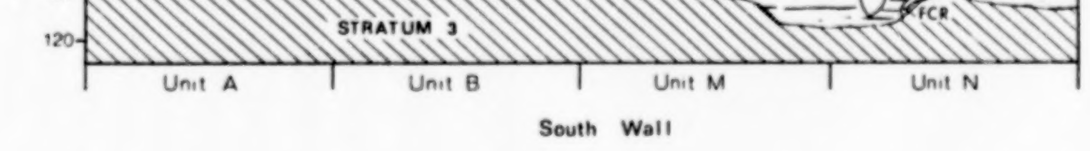


Figure 3-11. Simplified profile of the south wall of Units A/B/M/N showing the housepit outline.

in turn, helps to account for the "disturbed" stratigraphy encountered during the excavation of these units, especially in Units C/D. This disturbance was very likely a result in part of activities associated with Features 2, 3, 4, 10, and 11.

The unit profiles show that a number of pits were dug into underlying strata (Figures 3-2 and 3-3). For the most part, these pits contained little in the way of cultural materials and accordingly they were not given separate feature designations during excavation. Such pits are often associated with semisubterranean housepits in which they were commonly used for storage.

In addition to the cultural features noted above, the cliff profile clearly shows that the adult male burial occurred in a pit that had been dug into Stratum 3 from the overlying house floor (Figure 3-10). The association of the infant burial, Feature 5, with this housepit is also likely, but somewhat more problematical. The burial was encountered within a small pit dug into Stratum 3. If this burial was associated with the housepit, it was placed only shallowly (5-10 cm) below the floor.

The radiocarbon date of 3400 ± 240 BP from the carved whale bone artifact associated with the burial is statistically synchronous with the date of 3110 + 100 obtained from Feature 10 within the house (see the radiocarbon dating discussion below). In view of its proximity to the house floor, and considering the closeness of these radiocarbon dates, the interpretation seems reasonable that the infant burial was associated with the housepit. It is possible that there was a short hiatus in occupation of the house after the interment of the burial. Reoccupation a short time later would account for the close radiocarbon dates and the presence of a fire hearth (Feature 4) less than 10 cm above the burial area.

It should be noted that the presence of one housepit suggests that other house remains are also present at Yaquina Head. The alteration of the site's surface by historic building and bulldozing makes the identification of such features via depressions on the surface an impossible task. It is possible that the darker silty fill at the base of Stratum 1, such as that encountered in Units M/N and C/D, may be indicative of housepits or at least of intensive occupation. If this is the case, other units containing the dark silty fill--Units I/J/K/L (Figure 3-4) and, to a lesser extent, Units G/H (Figure 3-3)--may also be within the remains of aboriginal houses.

RADIOCARBON DATING

Twelve radiocarbon dates are available from the Yaquina Head archaeological site. Five dates were obtained from Stratum 1, four from Stratum 2, and three from Stratum 3. All of these dates are based on charcoal, with the exception of the date from the whale bone artifact associated with Feature 5. Information on the provenience of these dates is summarized in Table 3-4.

Radiocarbon dates from Stratum 1 range from 2310 BP to 3400 BP. Of the five Stratum 1 dates, the two younger ones are from excavation units near the cliff face (Units G and M), while two of the older dates are from units farther inland (Units F and I/L). The oldest (and most problematical) date is from the burial in Unit C near the cliff face.

The youngest date from Stratum 1, which is also the youngest date from the site as a whole, was from Feature 6, which occurred within the dark brown silt layer comprising the lower portion of Stratum 1 in much of the site. This feature also occurred between two separate depositions of Stratum 2A and, consequently, portions of both Stratum 1 and Stratum 2A postdate this time (Figure 3-3a). The other four dates from Stratum 1 overlap closely with the dates obtained from Stratum 2.

Radiocarbon dates from Stratum 2 range from 2670 BP, from the upper shell (Stratum 2A), to 3120 BP, the earliest of three dates from the lower shell (Stratum 2B). The three dates from the lower shell are all within 140 years of one another. In view of the closeness of the three dates from the lower shell, it appears that intensive exploitation of marine shellfish began rather abruptly at this site by about 3200 years ago. Use of shellfish appears to have continued until sometime after 2300 BP, as indicated by the date from Feature 6 mentioned above.

Radiocarbon dates from below the shell in Stratum 3 are 3360 BP, 3740 BP, and 5030 BP. Although the date from Feature 5, the infant burial, falls within this time period, its standard deviation is large, and its stratigraphic association appears to be with Stratum 1. These dates from the non-shell Stratum 3 confirm that shellfish exploitation probably did not begin in earnest until approximately 3200 years ago in this portion of the site.

The earliest date of 5030 BP was based on a large concentration of charcoal encountered in Level 13 (120-130 cm) in Unit A. The charcoal submitted for analysis was situated approximately 20 cm below the shell layer and within the dark yellowish-brown sandy loam of Stratum 3. No artifacts were found in the unit/level from which the analyzed charcoal was obtained, but several small fragments of burned shell were observed in the charcoal sample. In addition, one flake was recovered from the same level in adjacent Unit B, and another flake and some small burned shell fragments were recovered from Level 12, directly above the level from which the charcoal was collected. While the date of 5030 BP is significantly earlier than any of the others available, artifacts and burned shell fragments were recovered in immediate association, indicating that the charcoal was, in fact, related to use of the site by prehistoric peoples.

Table 3-4. Summary of radiocarbon dates from Yaquina Head.

Stratum	Unit	Depth Below Surface (cm)	Date BP	Laboratory Number	Association
1	G	70-80	2310 ± 60	Beta-20771	between shell layers; Feature 6
1	M	30-40	2880 ± 90	Beta-20770	above shell; sample closest to surface
1	F	40-50	2930 ± 90	Beta-20774	above shell; Feature 1
1	I/L	60-80	3200 ± 70	Beta-19828	above shell; initial occupation below dune
1/3	C	100-110	3400 ± 240	Beta-17841	below house floor; Feature 5
2A	B	50-60	2670 ± 70	Beta-19830	upper shell; obsidian point
2B	B	100-110	2980 ± 70	Beta-19831	lower shell
2B	N	80-100	3110 ± 100	Beta-19829	lower shell; Feature 10
2B	I	120-130	3120 ± 60	Beta-20772	lower shell
3	B	90-100	3360 ± 100	Beta-20773	below shell
3	I	160-170	3740 ± 110	Beta-19832	below shell; Feature 9
3/4	A	120-130	5030 ± 80	Beta-19833	below shell

The twelve radiocarbon dates available from Yaquina Head span a time period of 2720 years. Nine of these dates, however, are within 520 years of one another. In order to examine the contemporaneity of the radiocarbon determinations from Yaquina Head, the dates were subjected to the Student's t-test. This statistic allows the pairwise comparison of the means of two dates to determine if they are likely to be the same age (Thomas 1979:206-207). A matrix of the observed t-values for each pair of dates was prepared (Table 3-5). The values were then compared to the expected t-value for a level of error at the .001 level (with t = 3.29).

The dates were given numerical designations, numbers 1-12, in order to facilitate the presentation of data. These designations are correlated with the radiocarbon dates in Table 3-5 below. Figure 3-12 below shows the grouping of each date with other dates that are statistically the same. For example, date number 2 (2880 ± 90 BP) is statistically synchronous with dates numbered 3, 4, 5, 6, 7, 8, and 10. The comparison shows that the twelve dates can be placed into three statistically significant groups (Table 3-6), with the second group consisting of two subgroups.

The first grouping consists solely of date number 1, while the

Table 3-5. Matrix of observed t-values for pairwise comparison of radiocarbon dates. ($t_{.001} = 3.29$; if observed t-value is less than 3.29, then dates are probably the same; if greater than 3.29, dates are probably different; significant values are underlined.)

		Radiocarbon Dates											
		1	2	3	4	5	6	7	8	9	10	11	12
Date	(BP)	2310	2880	2930	3200	2670	2980	3110	3120	3360	3400	3740	5030
1	2310		5.3	5.7	9.7	3.9	7.3	6.8	9.5	9.0	4.4	10.2	27.2
2	2880			0.4	2.8	1.8	0.9	1.7	2.2	3.6	2.0	6.6	17.9
3	2930				2.4	2.3	0.4	1.3	1.8	3.2	1.8	5.7	17.5
4	3200					5.4	2.2	0.7	0.9	1.3	0.8	4.2	17.3
5	2670						3.1	3.6	4.9	5.6	2.9	8.2	22.3
6	2980							1.1	1.5	3.1	3.0	5.9	19.3
7	3110								0.1	1.8	1.1	4.2	15.0
8	3120									2.1	1.1	5.0	19.1
9	3360										0.2	2.6	13.0
10	3400											1.3	6.4
11	3740												9.5
12	5030												

second group encompasses the remaining dates from Stratum 1 and those from Stratum 2 as well (dates numbered 2 through 8 as well as date number 10). The second group also includes the ninth date--3360 ± 100 BP from Stratum 3--which is statistically synchronous with dates 3, 4, 6, 7, 8, 10, and 11.

However, date number 11--3740 ± 110 from Stratum 3--is statistically the same as only dates 9 and 10. Date number 10 has a very large standard deviation, and is statistically aligned with all the dates except 1 and 12. Thus, date 11 is linked to the other dates only by the similarity to date 9 and the similarity to date 10, the latter of which is not very useful analytically due to its very large standard deviation. This suggests that date 11 (3740 ± 110) should be seen as separate from the major grouping of dates 2-10, and that dates 9 (3360 ± 100) and 10 (3400 ± 240) may be viewed as transitional between dates 2-8 and date 11.

The transitional nature of dates 9 and 10 is supported stratigraphically, as well as statistically. Date 9 was obtained from the very top of Stratum 3, directly under the shell layer, and date 10 was obtained from a fragment of the whale bone artifact that was associated with the infant burial. The stratigraphic position of the burial was somewhat obscured by its placement with respect to the housepit, but it appears to have originated in Stratum 1, and was dug into the underlying Stratum 3.

The foregoing statistical analysis, together with the stratigraphic profiles, can be used to assign the radiocarbon dates to two cultural components. The dates numbered 9 and 11 from Stratum 3 and

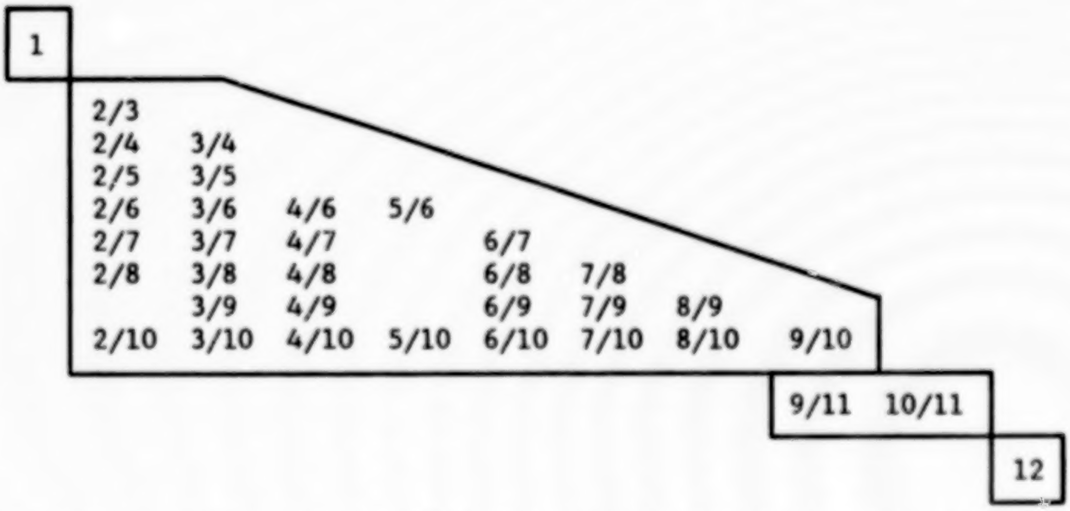


Figure 3-12. Summary of results of pairwise comparison of radiocarbon dates from Yaquina Head using the Student's t-test (based on Table 3-5 results).

Table 3-6. Summary of radiocarbon date groupings based on Student's t-test.

(1) 2310 ± 60	(2) 2880 ± 90	(12) 5030 ± 80
	(3) 2930 ± 90	
	(4) 3200 ± 70	
	(5) 2670 ± 70	
	(6) 2980 ± 70	
	(7) 3110 ± 100	
	(8) 3120 ± 60	
	(9) 3360 ± 100	
	(10) 3400 ± 240	
	----------------	
	(11) 3740 ± 110	

date 12, from the contact between Stratum 3 and Stratum 4, are grouped together into one cultural component. This earlier component dates from roughly 5000 years ago to 3200 years ago.

Date number 1, although it is statistically separate from dates 2-8, is combined with them to define a later cultural component. Date 10 is also included in this later component, but because of its large standard deviation, it is not considered useful in defining the temporal break between components. This later component dates from 3200 to approximately 2000 years. These two cultural components are discussed in further detail in Chapter 9.

CHAPTER 4

MOLLUSCAN REMAINS

by Debra C. Barner

The intertidal zone below the archaeological site on Yaquina Head is composed of eroded basalt bedrock with basalt boulders, cobbles, and pebbles comprising the beach gravels. This type of open, rocky coastal environment provides an ideal habitat for many kinds of marine shellfish, especially sea mussel and horse barnacle. That these and other species were an important subsistence resource exploited by the site's prehistoric inhabitants is amply demonstrated through analysis of the molluscan remains recovered from the shell midden deposits.

SAMPLING METHODS

During the course of the archaeological investigations at Yaquina Head, it was apparent that the shell midden was composed predominantly of sea mussel (Mytilus californianus). In order to determine the range of other molluscan species present, three methods of sampling the midden deposit were employed.

First, column samples were removed from five locations within the midden for the specific purpose of conducting midden analysis. These samples measured 10 x 10 cm and were removed in 10 cm intervals. Four of the column samples have been analyzed, and the results are presented in this report. The fifth column, from the wall of Test Unit A, has been submitted for curation and is available for future analysis.

Second, two additional samples, each measuring 10 x 10 x 10 cm, were removed from specific shell lenses in Strata 2A and 2B.

Third, "grab samples" of molluscan species were collected during the excavations. Although this method is clearly not as rigorous as the other sampling methods employed, grab sampling is more likely to ensure the reporting of molluscan species that are present at the site but which are missing by chance in the other samples. The grab samples also provided the whole valves of cockle (Clinocardium nuttalli), littleneck clam (Protothaca staminea), and butter clam (Saxidomus giganteus) which were analyzed in order to determine the season during which the site was occupied.

Table 4-1. Weight (in grams) of midden components by level, column samples, 35LNC62.

	Level												
Component	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
Column A													
Shellfish	8.0	153.4	499.8	534.0	322.4	146.9	163.6	211.3	198.0	73.0	2.4	--	2312.8
Land Snails	--	--	--	--	0.2	--	0.1	--	--	--	--	--	0.3
Bone	--	0.3	0.4	0.6	0.2	0.3	0.2	1.1	1.2	0.1	--	--	4.4
Cultural	2.9	1.6	0.3	--	2.9	0.5	--	8.1	--	--	--	--	16.3
Roots	22.4	0.9	0.9	--	--	--	--	--	--	--	0.2	--	24.4
Rock	5.4	54.4	9.0	6.7	4.1	8.4	8.3	9.4	23.9	2.3	0.3	--	132.2
Charcoal	--	1.7	3.9	1.4	0.8	2.5	0.7	0.4	2.3	0.4	0.5	2.2	16.8
Residue	483.9	515.4	567.5	673.8	802.2	765.2	811.5	650.8	1006.0	711.4	863.4	780.4	8631.5
TOTAL	522.6	727.7	1081.8	1216.5	1132.8	923.8	984.4	881.1	1231.4	787.2	866.8	782.6	11138.7
Column D													
Shellfish	0.2	334.3	479.5	257.3	21.3	--							1092.6
Land Snails	--	0.1	0.1	0.1	--	--							0.3
Bone	3.2	3.7	0.2	0.1	0.1	--							7.3
Cultural	1.2	0.5	1.5	--	--	--							3.2
Roots	0.1	0.1	--	--	--	--							0.2
Rock	40.4	10.1	7.7	97.0	71.3	61.9							288.4
Charcoal	1.6	0.6	0.9	0.6	0.9	--							4.6
Residue	944.4	633.8	686.7	655.9	934.2	726.6							4581.6
TOTAL	991.1	983.2	1176.6	1011.0	1027.8	788.5							5978.2
Column F													
Shellfish	18.4	306.9	157.6	108.8	257.6	199.3	172.9	30.9	1.8				1254.2
Land Snails	--	--	--	0.2	--	--	--	--	--				0.2
Bone	--	0.6	--	0.6	0.4	0.3	18.8	0.1	--				20.8
Cultural	--	--	1.5	--	0.1	0.1	--	--	--				1.7
Roots	2.0	--	0.1	--	--	--	--	--	--				2.1
Rock	26.7	190.7	6.2	12.2	7.6	4.3	6.2	1.2	--				255.1
Charcoal	0.3	0.2	0.6	0.3	0.8	1.5	1.5	0.1	--				5.3
Residue	754.6	1141.8	809.9	980.8	839.5	897.3	1031.6	881.9	690.7				8028.1
TOTAL	802.0	1640.2	975.9	1102.9	1106.0	1102.8	1231.0	914.2	692.5				9567.5
Column J													
Shellfish	--	47.9	140.4	338.2	283.7	64.9							875.1
Land Snails	--	--	0.1	0.1	0.1	--							0.3
Bone	--	0.1	5.0	0.3	0.1	0.2							5.7
Cultural	--	--	--	--	--	0.7							0.7
Roots	--	0.1	--	--	--	--							0.1
Rock	45.2	136.7	143.3	4.4	36.6	6.2							372.4
Charcoal	0.4	1.1	1.5	1.6	7.1	0.2							11.9
Residue	856.3	906.2	816.5	890.0	1068.4	932.3							5469.7
TOTAL	901.9	1092.1	1106.8	1234.6	1396.0	1004.5							6735.9

Table 4-2. Weight (in grams) and percent of shellfish components by level, Column A, 35LNC62.

	Level												
Shell Component	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
BIVALVES:													
Clinocardium nuttalli cockle	---	1.3 0.06%	---	---	1.7 0.07%	---	0.1 <0.01%	---	---	0.2 0.01%	---	---	3.3 0.14%
Macoma nasuta bent-nose clam	---	---	---	---	---	---	1.2 0.05%	---	---	---	---	---	1.2 0.05%
Mytilus californianus sea mussel	6.5 0.28%	149.4 6.46%	426.6 18.45%	460.7 19.92%	249.9 10.81%	98.2 4.25%	134.7 5.82%	181.9 7.86%	136.2 5.89%	54.7 2.37%	1.8 0.08%	---	1900.6 82.18%
Penitella penita piddock	0.6 0.03%	0.2 0.01%	4.1 0.18%	17.2 0.74%	14.1 0.61%	17.4 0.75%	4.6 0.20%	2.6 0.11%	9.9 0.43%	4.9 0.21%	---	---	75.6 3.27%
Tresus capax horse clam	---	---	---	---	1.1 0.05%	---	1.1 0.05%	---	---	---	---	---	2.2 0.10%
UNIVALVES:													
Acmaea sp. limpets	---	0.3 0.01%	0.7 0.03%	0.3 0.01%	0.3 0.01%	---	---	---	---	---	---	---	1.6 0.07%
Nucella sp. purples	---	---	0.5 0.02%	0.3 0.01%	1.2 0.05%	1.9 0.08%	2.2 0.10%	0.2 0.01%	0.9 0.04%	---	---	---	7.2 0.31%
OTHERS:													
Balanus cariosus horse barnacle	0.7 0.03%	1.1 0.05%	55.3 2.39%	50.1 2.17%	45.5 1.97%	23.8 1.03%	14.8 0.64%	22.0 0.95%	41.2 1.78%	10.8 0.47%	0.3 0.01%	---	265.6 11.48%
Balanus nubilus giant barnacle	---	---	4.7 0.20%	---	---	---	---	---	---	---	---	---	4.7 0.20%
Cancer sp. crab	---	---	0.4 0.02%	0.2 0.01%	0.3 0.01%	0.4 0.02%	0.1 <0.01%	0.1 <0.01%	0.1 <0.01%	---	---	---	1.6 0.07%
Katharina tunicata black katy chiton	---	---	---	2.6 0.11%	3.1 0.13%	2.1 0.09%	1.1 0.05%	0.9 0.04%	2.4 0.10%	0.7 0.03%	---	---	12.9 0.56%
Mitella polymerus goose barnacle	0.1 <0.01%	1.1 0.05%	5.9 0.26%	2.0 0.09%	3.9 0.17%	2.2 0.10%	3.0 0.13%	2.5 0.11%	2.8 0.12%	0.8 0.03%	0.2 0.01%	---	24.5 1.06%
Strongylocentrotus sp. sea urchin	---	---	---	---	0.3 0.01%	---	---	---	---	---	---	---	0.3 0.01%
Unidentifiable	0.1 <0.01%	---	1.6 0.07%	0.6 0.03%	1.0 0.04%	0.9 0.04%	0.7 0.03%	1.1 0.05%	4.5 0.19%	0.9 0.04%	0.1 <0.01%	---	11.5 0.50%
TOTAL SHELLFISH	8.0 0.35%	153.4 6.63%	499.8 21.61%	534.0 23.09%	322.4 13.94%	146.9 6.35%	163.6 7.07%	211.3 9.14%	198.0 8.56%	73.0 3.16%	2.4 0.10%	---	2312.8 100.0%

Standard procedures for midden analysis were followed in analyzing the column and lens samples (e.g. Meighan et al. 1958; Hester and Conover 1970). The samples were dried and then passed through 6-mm (1/4-inch) and 3-mm (1/8-inch) screens. The contents of the screens were sorted into the major component categories of molluscan species, bone, charcoal, rock, cultural material, and residue. The results of separating the midden samples into these major components are presented for each column in Table 4-1, and for the two lens samples in Table 4-6.

A comparative collection and several keys (Morris 1966; Cornwall 1975; Griffith 1975; Keep 1935; Quayle 1978) were used in the identification of the molluscan species. The material represented in the residue was too small to permit accurate sorting and was not further analyzed. Previous midden analyses have shown that the time spent in the lab sorting shell increases exponentially with the decrease in screen size (Koloseike 1968). After sorting, the midden components were weighed to 0.1 gram accuracy.

COLUMN SAMPLE ANALYSIS

The column samples selected for analysis were taken from Units A, D, F, and J. Columns A and F were taken from the deeper portions of the midden, while Columns D and J were from the shallower portions. In all cases, the column samples encompassed the full extent of the shell midden in each unit.

Thirteen different species of marine shellfish were represented in Column A. These species and their sample weights are listed in Table 4-2. Sea mussel comprised 82% of the marine shellfish in Column A. The second most frequent species, horse barnacle (Balanus cariosus), comprised 11%. Piddock (Penitella penita) is the next most common species at 3%. Goose barnacle (Mitella polymerus) constituted 1% of the sample. These four species together comprised nearly 98% of Column A. None of the remaining species represented more than 1% of the marine shellfish.

Twelve species of marine shellfish have been identified in Column D (Table 4-3). Five of these species together comprised nearly 99% of the shellfish, while the remaining seven species each constituted less than 1% of the midden. Sea mussel was the most common at 78%. Horse barnacle represented 11% of the marine shellfish. Piddock was the next most common species at 6%. Cockle and horse clam (Tresus capax) constituted 2% and 1%, respectively.

In Column F, fourteen species of marine shellfish were represented (Table 4-4). Sea mussel was again the most common with 76%. Horse barnacle was the second most frequently found species, representing 10% of the marine shellfish. Piddock at 5.5%, black katy chiton (Katharina tunicata) at 4%, and goose barnacle at 1% were the only other marine

Table 4-3. Weight (in grams) and percent of shellfish components by level, Column D, 35LNC62.

	Level						
Shell component	1	2	3	4	5	6	TOTAL
BIVALVES:							
Clinocardium nuttalli cockle	---	10.8 0.99%	9.4 0.86%	0.5 0.05%	---	---	20.7 1.89%
Mytilus californianus sea mussel	0.2 0.02%	310.4 28.41%	376.2 34.43%	164.4 15.05%	4.0 0.37%	---	855.2 78.27%
Penitella penita piddock	---	1.4 0.13%	38.3 3.51%	19.0 1.74%	5.5 0.50%	---	64.2 5.88%
Tresus capax horse clam	---	---	14.7 1.35%	---	---	---	14.7 1.35%
UNIVALVES:							
Acmaea sp.. limpets	---	0.1 0.01%	0.2 0.02%	0.2 0.02%	---	---	0.5 0.05%
Olivella biplicata purple olivella	---	---	0.1 0.01%	---	---	---	0.1 0.01%
Nucella sp. purples	---	0.5 0.05%	0.7 0.06	0.3 0.03%	---	---	1.5 0.14%
OTHERS:							
Balanus cariosus horse barnacle	---	9.3 0.85%	34.5 3.16%	67.2 6.15%	10.9 1.00%	---	121.9 11.16%
Balanus nubilus giant barnacle	---	0.3 0.03%	0.3 0.03%	---	---	---	0.6 0.05%
Cancer sp. crab	---	---	0.2 0.02%	0.2 0.02%	---	---	0.4 0.04%
Katharina tunicata black katy chiton	---	---	0.6 0.05%	0.5 0.05%	---	---	1.1 0.10%
Mitella polymerus goose barnacle	---	0.4 0.04%	2.4 0.22%	1.4 0.13%	0.2 0.02%	---	4.4 0.40%
Unidentifiable	---	1.1 0.10%	1.9 0.17%	3.6 0.33%	0.7 0.06%	---	7.3 0.67%
TOTAL SHELLFISH	0.2 0.02%	334.3 30.60%	479.5 43.89%	257.3 23.55%	21.3 1.95%	---	1092.6 100.0%

Table 4-4. Weight (in grams) and percent of shellfish components by level, Column F, 35LNC62.

	Level									
Shell component	1	2	3	4	5	6	7	8	9	TOTAL
BIVALVES:										
Clinocardium nuttalli	---	0.5	---	0.5	---	0.5	4.3	---	---	5.8
cockle		0.04%		0.04%		0.04%	0.34%			0.46%
Macoma nasuta	---	---	---	---	---	0.3	---	---	---	0.3
bent-nose clam						0.02%				0.02%
Mytilus californianus	14.0	270.0	122.6	87.0	235.1	141.2	68.1	18.5	1.1	957.6
sea mussel	1.12%	21.53%	9.78%	6.94%	18.75%	11.26%	5.43%	1.48%	0.09%	76.35%
Penitella penita	0.1	3.5	0.7	5.2	1.8	9.1	44.9	3.1	0.6	69.0
piddock	0.01%	0.28%	0.06%	0.41%	0.14%	0.73%	3.58%	0.25%	0.05%	5.50%
Protothaca staminea	---	---	---	0.1	0.6	0.2	0.1	---	---	1.0
littleneck clam				0.01%	0.05%	0.02%	0.01%			0.08%
Tresus capax	0.7	---	---	---	3.5	0.6	1.1	---	---	5.9
horse clam	0.06%				0.28%	0.05%	0.09%			0.47%
UNIVALVES:										
Acmaea sp.	---	0.2	0.1	---	0.1	0.2	0.1	---	---	0.7
limpets		0.02%	0.01%		0.01%	0.02%	0.01%			0.06%
Olivella biplicata	---	---	---	---	0.1	---	1.0	---	---	1.1
purple olivella					0.01%		0.08%			0.09%
Nucella sp.	---	2.8	---	2.9	1.2	0.2	1.0	0.8	---	8.9
purples		0.22%		0.23%	0.10%	0.02%	0.08%	0.06%		0.71%
OTHERS:										
Balanus cariosus	3.5	25.4	28.2	9.2	9.2	20.6	27.6	3.0	0.1	126.8
horse barnacle	0.28%	2.03%	2.25%	0.73%	0.73%	1.64%	2.20%	0.24%	0.01%	10.11%
Balanus nubilus	---	---	---	---	---	0.9	---	---	---	0.9
giant barnacle						0.07%				0.07%
Cancer sp.	---	---	---	0.1	---	---	0.1	---	---	0.2
crab				0.01%			0.01%			0.02%
Katharina tunicata	---	2.6	4.8	1.3	2.8	17.1	17.6	4.4	---	50.6
black katy chiton		0.21%	0.38%	0.10%	0.22%	1.36%	1.40%	0.35%		4.03%
Mitella polymerus	0.1	1.1	1.0	1.3	1.5	5.0	5.9	0.8	---	16.7
goose barnacle	0.01%	0.09%	0.08%	0.10%	0.12%	0.40%	0.47%	0.06%		1.33%
Unidentifiable	---	0.8	0.2	1.2	1.7	3.4	1.1	0.3	---	8.7
		0.06%	0.02%	0.10%	0.14%	0.27%	0.09%	0.02%		0.69%
TOTAL SHELLFISH	18.4	306.9	157.6	108.8	257.6	199.3	172.9	30.9	1.8	1254.2
	1.47%	24.47%	12.57%	8.67%	20.54%	15.89%	13.79%	2.46%	0.14%	100.0%

shellfish comprising over 1%. Together these five species made up 97% of the shellfish in the column.

Fourteen marine shellfish species were also found in column J (Table 4-5). Of these, only four total more than 1%. Sea mussel was again the most frequently identified species at 87%. Horse barnacle represented 5%. Piddock made up 2% of the marine shellfish. Cockle at 1% was the only other species representing more than 1%. Together, these four species make up 96% of the column.

LENS SAMPLE ANALYSIS

The two lens samples were both obtained from Unit G, with one sample from Stratum 2A and the other from Stratum 2B. Ten shellfish species were identified in the Stratum 2A sample, while nine species were identified in the sample from Stratum 2B (Table 4-6). Black katy chiton was not represented in the sample from Stratum 2B. Sea mussel represented over 70% of the shellfish in both stratum samples. Horse barnacle was also a major component of both samples, while piddock was strongly represented only in the Stratum 2B sample. The remaining species comprised only minor components of the two stratum samples.

GRAB SAMPLE ANALYSIS

During the fieldwork at Yaquina Head, any potentially identifiable shell other than sea mussel was collected while passing the cultural deposit through 3-mm (1/8-inch) mesh screens. The remains recovered in this manner are identified in Table 4-7. Twenty-three species were collected, five of which are not represented in the column samples. In contrast, only one species found in the column samples was not also represented in the grab samples.

In Table 4-7, an attempt has been made to quantify the frequency of shellfish species by means of the number of levels and strata in which they were found. Butter clam was not found in the column samples, but it was represented in many of the unit levels. Bay mussel (Mytilus edulis), keyhole limpet (Diodora aspera), dire welk (Searlesia dira), and gumboot chiton (Cryptochiton stelleri) were identified in one unit/level each, but also were not found in the column samples. The purple snails (Nucella canaliculata, N. emarginata, and N. lamellosa) and limpets (Acmaea digitalis, A. pelta, and A. persona) were relatively large and in good condition for identification, unlike the snail and limpet specimens in the column samples. Because of their relatively small size and weight, these univalves and black katy chiton did not make up a large percentage of the column samples, but they occurred in the midden on a regular basis.

Table 4-5. Weight (in grams) and percent of shellfish components by level, Column J, 35LNC62.

Shell component	Level 1	2	3	4	5	6	TOTAL
BIVALVES:							
Clinocardium nuttalli cockle	---	1.7 0.19%	0.2 0.02%	---	7.8 0.89%	---	9.7 1.11%
Macoma nasuta bent-nose clam	---	---	---	---	6.8 0.78%	---	6.8 0.78%
Mytilus californianus sea mussel	---	38.7 4.42%	124.9 14.27%	311.9 35.64%	232.7 26.59%	55.6 6.35%	763.8 87.28%
Penitella penita piddock	---	0.1 0.01%	3.3 0.38%	9.7 1.11%	5.6 0.64%	1.0 0.11%	19.7 2.25%
Protothaca staminea littleneck clam	---	0.1 0.01%	1.8 0.21%	---	---	---	1.9 0.22%
Tresus capax horse clam	---	4.4 0.50%	---	---	---	---	4.4 0.50%
UNIVALVES:							
Acmaea sp.. limpets	---	0.3 0.03%	0.1 0.01%	0.1 0.01%	0.1 0.01%	---	0.6 0.07%
Nucella sp. purples	---	0.1 0.01%	0.9 0.10%	0.1 0.01%	0.8 0.09%	0.7 0.08%	2.6 0.30%
OTHERS:							
Balanus cariosus horse barnacle	---	1.3 0.15%	6.8 0.78%	11.4 1.30%	20.3 2.32%	5.6 0.64%	45.4 5.19%
Balanus glandulus acorn barnacle	---	---	0.1 0.01%	---	---	---	0.1 0.01%
Balanus nubilus giant barnacle	---	---	0.1 0.01%	---	---	---	0.1 0.01%
Cancer sp. crab	---	0.1 0.01%	---	---	---	---	0.1 0.01%
Katharina tunicata black katy chiton	---	0.3 0.03%	0.7 0.08%	0.9 0.10%	2.5 0.29%	1.2 0.14%	5.6 0.64%
Mitella polymerus goose barnacle	---	---	0.6 0.07%	0.6 0.07%	2.5 0.29%	0.1 0.01%	3.8 0.43%
Unidentifiable	---	0.8 0.09%	0.9 0.10%	3.5 0.40%	4.6 0.53%	0.7 0.08%	10.5 1.20%
TOTAL SHELLFISH	---	47.9 5.47%	140.4 16.04%	338.2 38.65%	283.7 32.42%	64.9 7.42%	875.1 100.0%

Table 4-6. Weight (in grams) and percent of shellfish components, lens samples, 35LNC62.

	Stratum	
Shell component	2A	2B
BIVALVES:		
Clinocardium nuttalli	1.0	0.8
cockle	0.18%	0.44%
Mytilus californianus	410.7	133.2
sea mussel	72.31%	73.88%
Penitella penita	0.1	20.4
piddock	0.02%	11.31%
Protothaca staminea	0.5	0.3
littleneck clam	0.09%	0.17%
Tresus capax	2.7	4.7
horse clam	0.48%	2.61%
UNIVALVES:		
Acmaea sp.	0.8	0.2
limpets	0.14%	0.11%
Nucella sp.	0.9	0.2
purples	0.16%	0.11%
OTHERS:		
Balanus cariosus	130.7	19.0
horse barnacle	23.01%	10.54%
Katharina tunicata	0.4	---
black katy chiton	0.07%	
Mitella polymerus	18.7	0.2
goose barnacle	3.29%	0.11%
Unidentifiable	1.5	1.3
	0.26%	0.72%
MIDDEN COMPONENTS:		
Total Shellfish	568.0	180.3
Bone	4.4	0.1
Cultural	65.5	---
Rock	97.6	156.8
Charcoal	1.2	0.7
Residue	598.9	707.1
TOTAL	1335.6	1045.0

Table 4-7. Marine shellfish represented in grab samples, 35LNC62.

	Stratum								Number of Unit/Levels
Species	1	1A	1+2	2	2A	2B	2+3	3	Represented
BIVALVES:									
Clinocardium nuttalli	4	-	-	25	-	2	-	-	31
Macoma nasuta	-	-	-	6	-	1	-	-	7
Mytilus californianus	6	1	-	33	-	3	-	1	44
M. edulis	-	-	-	1	-	-	-	-	1
Penitella penita	2	-	1	26	-	4	-	1	34
Protothaca staminea	1	-	-	5	-	-	-	-	6
Saxidomus giganteus	5	-	-	12	1	2	-	1	21
Tresus sp.	1	-	-	16	-	1	-	-	18
UNIVALVES:									
Acmaea sp.	4	-	1	6	-	-	-	-	11
A. digitalis	1	-	-	5	-	-	-	-	6
A. pelta	3	-	-	9	-	-	-	-	12
A. persona	-	-	-	3	-	-	-	-	3
Diodora aspera	-	-	-	1	-	-	-	-	1
Olivella biplicata	-	-	-	1	-	-	-	-	1
Searlesia dira	-	-	-	1	-	-	-	-	1
Nucella canaliculata	2	-	1	29	1	2	-	-	35
N. emarginata	7	-	1	35	-	6	-	2	51
N. lamellosa	4	-	-	11	-	1	-	-	16
OTHERS:									
Balanus cariosus	4	-	-	19	-	2	-	3	28
B. nubilus	1	-	-	6	-	-	-	-	7
Cryptochiton stelleri	-	-	-	1	-	-	-	-	1
Katharina tunicata	17	1	1	51	1	11	1	9	92
Mitella polymerus	-	-	1	5	-	-	-	1	7

MOLLUSC AVAILABILITY

Sea mussel, which was by far the most common species represented in the shell midden on Yaquina Head, inhabits the middle tidal range and could be collected at low tides throughout the year. The byssal threads intertwine, so that collecting them in clumps is relatively easy. When collecting sea mussels in this way, smaller species may be collected accidentally, and this probably accounts in large measure for the variety of other molluscan species represented.

Horse barnacle is normally found in a lower intertidal zone than sea mussel, but it often overlaps into the mussel's range. This barnacle does not have a base and would therefore be difficult to collect off the rocks without damaging the meat. If it was gathered as a hitchhiker along with sea mussel, however, it could have been procured without damage.

Unlike sea mussel and horse barnacle, which attach to rock surfaces, piddock can bore into rock that is extremely hard (Ricketts and Calvin 1968:274), making it difficult to collect. Fragments of the basalt rocks which piddock bore into were found during the excavations. Piddock inhabits the lower/middle intertidal zones and could have been collected during low tides throughout the year. It was widely distributed in the midden.

Goose barnacle was found on a regular basis throughout the samples. Since goose barnacle inhabits the middle intertidal zones, it would have been easily accessible throughout the year. Coastal peoples sometimes built fires over barnacles, roasted them in place on the rocks, and consumed them on the spot (Harrington 1943; Greengo 1952:72). If this was a common practice, it would result in an underestimation of the extent to which goose barnacle was used as food.

Black katy chiton was also found on a regular basis in the samples, with large numbers of plates being identified in the grab samples. In one grab sample, 312 plates were recovered. A minimum number of 22 chitons was obtained by counting the anterior plates. Black katy attains an edible size and was probably used for food. It inhabits lower/middle intertidal zones and can occasionally be found with sea mussel.

Giant barnacle (Balanus nubilus) inhabits the rocky outer coast in the lower intertidal zone and could be collected only during very low tides. It was probably not collected for food on a systematic basis. This barnacle is sometimes found growing on seaweed and could have been collected after being washed ashore following a storm.

Most of the snails and limpets are small. Since they inhabit the same or overlapping intertidal areas with sea mussel, they probably hitchhiked to the site with the mussel. Wrinkled purple, keyhole limpet, gumboot chiton, and sea urchin (Strongylocentrotus sp.) attain an edible size and were probably used as a food source. They were rarely found in the samples, and it is doubtful that they were used on a regular basis.

Horse clam, bent-nose clam (Macoma nasuta), cockle, bay mussel, littleneck clam, and butter clam are protected water species and may be found in protected areas of the outer coast. Reports to the Oregon Department of Fish and Wildlife on collections made by biology classes at Yaquina Head list all of these species except horse clam (Oregon Department of Fish and Wildlife 1987). The quantities of these species found in the midden are limited, especially butter clam. Because they have stout, bowl-shaped shells, horse clam, butter clam, littleneck clam, and cockle may also have been collected for use as spoons, ladles, and containers (Barnett 1937:168). Bay mussel was one of the rarer species found. Because it has a fragile and easily fragmented shell, it would not likely be identifiable in the samples.

Olivella (Olivella biplicata) was found in small quantities. Collections in the area have also yielded examples of this species (Oregon Department of Fish and Wildlife 1987). These snails could have been collected on the sandy beaches to the north of the site. Their use as beads is widely noted in the ethnographic literature for the Oregon coast (Barnett 1937:174).

The crab remains were only the tips of claws, which could not be identified further. A large number of crab species have been identified in the area, including Cancer oregonensis, C. productus, C. antennarius, Hemigrapsus oregonensis, H. nudus, and Oedignathus sp. (Oregon Department of Fish and Wildlife 1987).

In addition to the marine shellfish, two species of land-dwelling snails were identified. Townsend's snail (Polygyra townsendiana) and a type of Selen (Selenites sp.) were found in the midden. Because both of these snails occur naturally within the area, identification of their use for subsistence purposes is problematical.

SUMMARY

Sea mussel was the dominant marine shellfish species exploited by the prehistoric inhabitants of Yaquina Head, accounting for approximately 81% of the identifiable remains by weight. Although they were found consistently throughout the midden, horse barnacle, piddock, goose barnacle, and black katy chiton were less intensively used. Horse clam, littleneck clam, butter clam, and cockle were also present, but to a much lesser extent. Given the rocky intertidal zone environment adjacent to the site, the presence of mussel, piddock, chiton, and barnacles is to be expected. The less frequently encountered clam and cockle species were probably available in quantity only at protected beaches at some distance from the site.

It appears, then, that the prehistoric inhabitants of Yaquina Head relied heavily on the readily available intertidal shellfish species close to the site. Analysis of the growth rings on certain species of marine shellfish has been shown to be a reliable means of estimating the season of occupation at archaeological sites. The results of a study of growth rings on specimens from Yaquina Head and the implications for seasonality are discussed in Chapter 9.

CHAPTER 5

VERTEBRATE FAUNAL REMAINS

by Ruth L. Greenspan and Rebecca J. Wigen

Vertebrate faunal remains recovered from the excavations at Yaquina Head include 7919 specimens. This total includes 73 specimens recovered during the auger hole excavations, 102 specimens recovered from the shell column samples, and 7744 specimens from the unit excavations. Although much of the bone was highly fragmentary, preservation appeared fairly good.

All vertebrate faunal remains recovered during the excavations at Yaquina Head are included in this analysis. These faunal remains were collected in two ways. Most of the specimens were recovered during the course of excavations as the cultural deposit was passed through 3-mm (1/8-inch) mesh. A separate sample of faunal materials was obtained from the column samples taken for the purpose of midden analysis. These samples were passed through a set of nested screens ranging from 6 mm (1/4-inch) to 1 mm in size. Because of the more intensive nature of the recovery process, the faunal remains from the column samples are not included in the analyses based on the sample from the unit excavations.

The vertebrate faunal remains were identified using comparative osteological materials at the American Museum of Natural History, the Smithsonian Institution, the University of Oregon, and the University of Victoria. All of the faunal elements were considered for identification, and all specimens were identified to the lowest possible taxonomic unit.

Forty-three percent of the assemblage was not identifiable on any taxonomic level. Fish constitute 26.4% of the assemblage, birds represent 8.9%, marine mammals are 1.6%, terrestrial mammals are 1.2%, and unidentifiable mammals comprise 18.8% of the faunal remains. The distribution of faunal remains by stratum is shown in Table 5-1. A few of the bones from outside the unit excavations were recovered from slumped areas along the cliff face and have no level or stratum proveniences. These are presented separately in Table 5-1.

TERRESTRIAL MAMMALS

The terrestrial mammal assemblage from 35LNC62 is dominated by deer and elk. Although only 28 specimens were identified as deer, 20 specimens as elk, and 10 specimens could be either, a large number of the specimens classified as unidentifiable mammals are probably also deer or elk. Many of these highly fragmentary specimens, while lacking any diagnostic attributes, are of a size and texture that suggest they are large terrestrial mammals. Because deer and elk are the only large terrestrial mammals identified from the site, it is likely that these unidentifiable fragments also represent these animals.

Other terrestrial mammals represented at the site include dog or coyote, mink, hares or rabbits, beaver, vole, unidentifiable rodent, and shrew. Some of the rodents are apparently intrusive to the cultural deposit; these are designated with an asterisk in Table 5-1, and are omitted from all subsequent analyses.

The only terrestrial mammals that reportedly inhabit the Yaquina Head area at present are the Columbia ground squirrel, the white-footed deer mouse, the Yaquina shrew mole, and the Townsend's chipmunk. Large terrestrial mammals and presumably other species that formerly occupied the headland have been eliminated by the intensive human activity associated with the lighthouse facility (Bureau of Land Management 1983). However, all of the terrestrial mammals identified from the faunal assemblage are species that are presently distributed along nearby portions of the Oregon coast (Maser et al. 1984), and presumably these animals were available in the general site vicinity in prehistoric times.

MARINE MAMMALS

The marine mammals recovered from 35LNC62 include harbor seal, Steller sea lion, California sea lion, northern fur seal, whale, and sea otter. Juvenile specimens of harbor seal, northern fur seal, and sea otter are present in the assemblage.

Harbor Seal (*Phoca vitulina*)

Harbor seals are very common marine mammals along the Oregon coast. They are basically non-migratory animals, and are found along the Oregon coast throughout the year. Harbor seals are commonly found near shore, in bays and estuaries, and occasionally in freshwater river systems. Hauling out places include sand bars, mud flats, rocks, islands, and reefs where water is always accessible (Mate 1984:438-439). At Yaquina Head harbor seals haul out on the rocks in or near the intertidal zone (Bureau of Land Management 1983:13).

Table 5-1. Inventory of faunal remains recovered from 35LNC62.

Taxon	Common Name	Stratum 1	Stratum 2	Stratum 3	Auger Holes	Shell Column Samples	Misc⁺	TOTAL
TERRESTRIAL MAMMALS:								
Odocoileus hemionus	Mule deer	1	26	1				28
Cervus elaphus	Elk	1	18				1	20
Cervidae	Deer or elk	8	2					10
Canis sp.	Dog or coyote		3					3
Mustela vision	Mink		7					7
Carnivora	Carnivores		2					2
Leporidae	Rabbits or hares		5					5
Castor canadensis	Beaver		1					1
Microtinae	Voles		1/4*	1				2/4*
Rodentia	Rodents	1	13	2				16
Soricidae	Shrews		1					1
MARINE MAMMALS:								
Phoca vitulina	Harbor seal	1	2					3
Eumetopias jubatus	Steller sea lion		5	1				6
Zalophus californianus	California sea lion	1	1					2
Callorhinus ursinus	Northern fur seal	2	5		1			8
Otariidae	Eared seals	4	11	1				16
Pinnipedia	True and eared seals	2	9		1	1		13
Cetacea	Whales	9	37	5			1	53
Enhydra lutris	Sea otter		14					14
UNIDENTIFIABLE MAMMALS		366	1070	23	18	2	14	1493
FISH:								
Hydrolagus colliei	Ratfish		5					5
Clupea pallasii	Pacific herring	5	126		1	1		133
Salmonidae	Salmon and trout	1	15					16
Merlucccius productus	Pacific hake	11	253			2		266
Microgadus proximus	Pacific tomcod		36					36
Gadidae	Codfishes	1	1					2
Rhacochilus vacca	Pile surfperch	1	4					5
Embiotoca lateralis	Striped surfperch		5					5
Embiotociade	Surfperches	19	165			1		185
Sebastes sp.	Rockfishes	2	37	1				40
Hexagrammos sp.	Greenlings	22	153	6	3	2		186
Ophiodon elongatus	Lingcod	1	17	1		1		20
Hexagrammidae	Greenlings		2					2
Enophrys bison	Buffalo sculpin		32					32
Leptocottus armatus	Staghorn sculpin		3					3
Cottidae	Sculpins		13					13
Platichthys stellatus	Starry flounder		11	1				12
Hippoglossus stenolepis	Pacific halibut		2				1	3
Pleuronectidae	Righteye flounders	1	15					16
Unidentified fish		107	1074	10	15	10		1216
BIRDS:								
Gavia immer	Common loon	1	8					9
Gaviidae	Small loons				1			1
Aechmophorus occidentalis	Western grebe		2					2
Diomedeidae	Albatrosses	2	24	2	3			31

Table 5-1 (continued)

Taxon	Common name	Stratum 1	Stratum 2	Stratum 3	Auger Holes	Shell Column Samples	Misc⁺	TOTAL
BIRDS (continued):								
Fulmaris glacialis	Fulmar		5					5
Puffinus sp.	Shearwaters	4	7					11
Phalacrocorax sp.	Cormorants	1	32	2				35
Mergus sp.	Mergansers		1					1
Aythya sp.	Scaups		2					2
Melanitta deglandi	White-winged scoter	3	8		1			12
Melanitta sp.	Scoters		6					6
Aythyinae	Bay and sea ducks	1	20					21
Anserinae	Geese	1	11					12
Anatidae	Waterfowl	3	36	3				42
Tetraonidae	Grouse	1						1
Fulica americana	American coot		1					1
Scolopacidae	Sandpipers		6					6
Larus sp.	Gulls	12	48					60
Sterna sp.	Terns		3					3
Charadriiformes	Shorebirds		1					1
Uria aalge	Common murre	1	19					20
Cerorhinca monocerata	Rhinocerous auklet		3					3
Alcids	Auks and relatives	1	5					6
Brachyramphus marmoratum	Marbled murrelet		4					4
Corvus corax	Raven	1	2					3
Corvus caurinus	Northwestern crow		1					1
Passeriformes	Perching birds		4					4
Unidentified bird		77	309	5	8	2		401
UNIDENTIFIABLE BONE FRAGMENTS		633	2649	27	21	80	3	3413
TOTALS		1309	6319	92	73	102	20	7915

+ from slump along the cliff face
* apparently intrusive

Harbor seal pupping season varies geographically, occurring later in the year at more northerly locations. Along the Oregon coast most pups are born in April and May, but there is considerable variation, and births have been recorded as early as mid-February and as late as mid-June (Mate 1984:440).

Harbor seals are monogynous breeders. Because of the lack of dominance and territoriality associated with this breeding strategy, there is no selective advantage in larger, more aggressive males. Thus males tend to be only slightly larger than females, and the two are difficult to distinguish skeletally.

Steller Sea Lion (*Eumetopias jubatus*)

The Steller, or northern, sea lion is the largest of the sea lions. It ranges from San Miguel Island, California, north to the Pribilof Islands, and in the western Pacific, south to Hokkaido (King 1983:20). Steller sea lions occasionally haul out on the rocks below Yaquina head (Bureau of Land Management 1983:13).

Although they are primarily a nearshore species, Steller sea lions rarely breed or haul out on the mainland, preferring rocky areas on offshore islands. In Oregon adult males arrive at breeding grounds in June and compete amongst themselves for the best territories. One male breeds with many females. The stronger, more aggressive males establish the better territories that the females are attracted to, and thus enjoy greater reproductive success. This situation selects for large, aggressive males, and there is considerable sexual dimorphism with respect to size in this species (Mate 1984:450).

Males remain on the rookeries throughout the breeding season. In mid-July, at the end of the breeding season, adult males in California, Oregon, and Washington leave the breeding grounds and go north into British Columbia and Alaska. By the end of October no adult males remain along the Oregon coast, although females and pups may overwinter there (Mate 1984:449).

California Sea Lion (*Zalophus californianus*)

Along the coast of North America the California sea lion is distributed primarily in Californian waters, ranging from the Channel Islands south to the southern tip of Baja California, Mexico, and throughout the Gulf of California. At the end of the breeding season in mid-July some adult and subadult males move north to overwinter in British Columbia. Although there are no breeding grounds in Oregon, migrant males are not uncommon in Oregon waters during the fall and winter, with peak populations occurring in September and October (Mate 1984:452-453).

The size range of adult male California sea lions overlaps with that of adult female Steller sea lions, and it is difficult to distinguish between them from most postcranial skeletal elements. Of the two elements from 35LNC62 identified as *Zalophus californianus*, one might possibly be adult female *Eumetopias jubatus*. The other is a skull fragment that includes part of the saggital crest that is diagnostic of adult male *Z. californianus*. A number of other specimens that are either female *E. jubatus* or male *Z. californianus* were classified as Otariidae, the family that includes both sea lions and the northern fur seal.

Northern Fur Seal (Callorhinus ursinus)

In the eastern Pacific northern fur seals are distributed between two breeding areas: one in the Pribilof Islands, which is the largest northern fur seal population in the world, and a second, small population on San Miguel Island. The San Miguel population was established quite recently, in the 1960's (King 1983:61).

On the Pribilof Islands pupping and breeding season is from mid-June until late July, after which adult females and subadults of both sexes migrate south, some as far as southern California. Some adult males also migrate; others remain in northern waters throughout the year. All northern fur seals are pelagic except during breeding season, and generally they stay within 16 to 160 km offshore. They are very rarely seen on shore on the Oregon coast (Mate 1984:456-457).

Three of the C. ursinus specimens recovered from 35LNC62 are from individuals estimated to be 10-11 weeks old. Two of these specimens are from the same level in Unit D, Stratum 2, and are most likely from the same individual. The third is from Unit K, Stratum 1, both horizontally and stratigraphically removed from the other two, and is almost certainly from a different individual. The other C. ursinus material in the assemblage includes adult female, and older juveniles ranging in age from less than one year to less than three years.

In their first year, fur seals in the Pribilofs leave the islands in early November, and do not reach the Oregon coast until January or later, when they are roughly six months old (Fiscus 1972:8-9). Thus, the presence of such young C. ursinus specimens strongly suggests that the distribution of northern fur seal breeding grounds was different in the prehistoric past than it is today, and that C. ursinus was possibly breeding along the Oregon coast. C. ursinus specimens have been recovered from other archaeological sites in the Pacific Northwest, including 35LNC50 (this report), the nearby Seal Rock site (Snyder 1978), Tahkenitch Landing in Douglas County on the Oregon coast (Greenspan 1986), at Hoko on the Washington coast (Wigen, personal communication 1986), and at Hesquiat Harbor in British Columbia (Frederick, personal communication 1986).

Sea Otter (Enhydra lutris)

Sea otters were formerly widely distributed on both sides of the Pacific. In the eastern Pacific, they ranged from central Baja California north along the entire coast of North America (Kenyon 1975). Overhunting resulted in their extinction in much of their former range, and they apparently were gone from the Oregon coast by 1906. In 1911 sea otters were declared a protected species and their numbers have increased since that time. Reintroductions to the Oregon and Washington coasts have had only limited success (Mate 1984:430).

Sea otters occupy waters of the open coast. Although they do enter bays, they never go far from the open sea. They dive for food on the ocean bottom in water no deeper than 54 m. Favored habitats are waters adjacent to rocky coasts in areas with extensive underwater reefs and kelp beds, such as those in the intertidal zone surrounding Yaquina Head. Sea otters do haul out on land, preferably on rocky points, but sometimes on sand beaches or spits (Kenyon 1975:57).

Sea otters do not have a fixed breeding season; they may mate throughout the year, but most mating seems to occur in June. Gestation period is from 10 to 12 months, and most births occur in spring and summer (Kenyon 1975:235-239). Although several juvenile specimens were recovered at 35LNC62, lack of a fixed pupping season and lack of adequate age data in available comparative collections make seasonal estimates from the presence of immature specimens very difficult.

Whales (Cetacea)

All of the whale material recovered from 35LNC62 was too fragmentary for any more specific identification. Gray whales pass the tip of the headland on their annual migrations north and south (Bureau of Land Management 1983:18), and while the excavations were taking place in early September, tourists reported seeing killer whales (which are actually large dolphins) nearby. Many other species of whales occur along the Oregon coast.

FISH

The most abundant fish remains recovered from 35LNC62 are those of hake (Merluccius productus). Other fish strongly represented in the assemblage are surfperches (Embiotocidae), including striped surfperch (Embiotoca lateralis) and pile surfperch (Rachochilus vacca); greenlings (Hexagrammos sp.); and Pacific herring (Clupea pallasii). Fish represented in smaller quantities include sculpins (Cottidae), including buffalo sculpin (Enophrys bison) and Pacific staghorn sculpin (Leptocottus armatus); rockfish (Sebastes sp.); tomcod (Microgadus proximus); flatfish (Pleuronectidae), including starry flounder (Platichthys stellatus) and halibut (Hippoglossus stenolepis); lingcod (Ophiodon elongatus, a large member of the greenling family); salmon (Salmonidae); and ratfish (Hydrolagus colliei). Most of these fish are resident in rearshore habitats in the vicinity of Yaquina head.

In an effort to understand the dynamics of human adaptation to the marine environments of the central Oregon coast, Zontek (1982) defined six ocean habitats and listed the fish species commonly distributed in each of them (Table 5-2). Comparing the data presented in Table 5-1 with the fish habitats shown in Table 5-2 indicates that rocky shores and nearshore rocky reefs were most likely the habitats commonly exploited for marine fishing by the occupants of 35LNC62. Surfperches and greenlings, which are strongly represented in the Yaquina Head faunal assemblage, commonly feed in the intertidal, rocky shores habitat; buffalo sculpin, staghorn sculpin, and rockfish are also common in that habitat. Lingcod invade the rocky intertidal zone, more commonly during their winter spawning period. Ratfish, rockfish, lingcod, hake, and less commonly greenling, salmon, and starry flounder are found in the nearshore rocky reef habitat (Zontek 1982:16-19).

Although herring are offshore residents, they do come into shallow water to spawn. In Oregon most herring populations spawn between January and March (Morrow 1983:17-19; Eschmeyer, Herald, and Hammann 1983:71). The annual inshore movement of herring is variable in time; they may come in just before actual spawning activity, or they may come in several months prior to that (Hart 1973:97-99).

Another species present in the assemblage that does not appear in Table 5-2 is the Pacific tomcod. Tomcods generally occupy sandy bottom habitats, at depths up to 260 m. They are found in shallower waters as well, and often school near shore in the summer months (Eschmeyer, Herald, and Hammann 1983:98).

Halibut are another recovered species not shown in Table 5-2. Halibut are bottom feeders on the shallower portions of the continental shelf. Halibut grow to be quite large (nearly nine feet long and over 475 pounds), although the average size is more on the order of 35 pounds (Hart 1973:614-615). Halibut have provided major aboriginal and commercial fisheries.

BIRDS

The largest group of birds represented in the faunal assemblage recovered from Yaquina Head is waterfowl (Anatidae), including geese, and various bay and sea ducks, particularly scoters and scaup. Dabbling ducks, which characteristically inhabit sheltered lagoon-like habitats, are notably absent. Other birds represented include albatross (family Diomedeidae); shearwaters (family Procellariidae); cormorants (Phalacrocorax sp.); alcids, gulls and shore birds (order Charadriiformes); grebes (Podicipedidae); loons (Gaviidae); coot (Fulica americana); sandpipers (Scolopacidae); grouse (Tetraonidae; crows and ravens (Corvus sp.); and some perching birds (Passeriformes).

Waterfowl (Anatidae)

The waterfowl are a large group of aquatic birds, including swans, geese, and ducks, that includes both resident and migrant species on the Oregon coast. The faunal assemblage from Yaquina Head includes

Table 5-2. Marine habitats and associated fish species (adapted from Zontek 1982).

Marine Habitat	Fish Species
Sandy beaches	Smelt (early spring to early fall) Surfperches (most available spring to early fall)
Rocky shores	Surfperches (especially striped surfperch) Greenlings (especially kelp greenling) Rockfish (especially black rockfish) Sculpins (especially buffalo sculpin and staghorn sculpin) Lingcod (more abundant in winter)
Nearshore rocky reefs	Ratfish Rockfish Lingcod Big skate Hake Kelp greenling Salmon Starry flounder Sturgeon
Inner continental shelf	Flatfish Lingcod Rockfish
Outer continental shelf	Hake Flatfish Sablefish Lingcod Rockfish
Pelagic waters	Smelt Anchovy Herring Salmon Cod Hake Spiny dogfish

specimens representing geese and various diving ducks, including merganser, scoter, and scaup.

Geese are not common in the Yaquina Head area, and they neither breed nor winter there. Although they are not listed as one of the 37 species that use the area during periods of migration and wintering (Bureau of Land Management 1983:14, based on an undated report of the Oregon State University Marine Science Center), reports on Oregon coast birds filed with the U.S. Department of Agriculture's Biological Survey between 1884 and 1923 indicate that geese (of generally undetermined species) were regularly, if not commonly, observed at Yaquina Head in spring and early fall, during their annual migrations (Bayer 1986).

The white-winged scoter (Melanitta deglandi) is an abundant winter and fairly common summer resident along the Oregon coast, where they have been recorded during every month of the year (Gabrielson and Jewett 1970:168). Although they do not breed at Yaquina Head, their abundance there during periods of migration and wintering is listed as "numerous" in the OSU Marine Science Center report (Bureau of Land Management 1983:14). Scoter remains representing a smaller species than M. deglandi were also identified in the faunal assemblage; these probably represent M. perspicillata, the surf scoter. The surf scoter is also a common year-round resident of the Oregon coast (Gabrielson and Jewett 1970:171) and is listed as "numerous" at Yaquina Head (Bureau of Land Management 1983:14).

The scaup (Aythya sp.) bones identified from the midden probably represent the greater scaup, A. marila. This bird winters on the Oregon coast, where it has been reported from October to February (Gabrielson and Jewett 1970:158). It is not listed as one of the birds that uses the Yaquina Head area during periods of wintering (Bureau of Land Management 1983:14), but in 1905 and 1906 a few scaup were reported at Yaquina Head, one in late November and three in mid-April (Bayer 1986:49-50). Most of the birds in the Yaquina Head faunal assemblage that are classified as Aythyinae (bay and sea ducks) are, on the basis of size, thought to be either scoters or scaup.

The specimen of merganser (Mergus sp.) identified in the Yaquina Head assemblage is probably M. serrator, the red-breasted merganser. This bird is an abundant winter resident on coastal bays and large river mouths in Oregon, where it has been recorded from late November through May (Gabrielson and Jewett 1970:176). This species is not listed as using the Yaquina Head area (Bureau of Land Management 1983:14), but in 1896 was reported as a rare visitor to the headland, where it was spotted in February and in May. That same year the common merganser, M. merganser, also observed in February and May, was described as common (Bayer 1986:35). (The common merganser was not seen any more frequently than the red-breasted merganser; the description of it as "common" appears to be based on the sighting of six specimens, as opposed to a single specimen of red-breasted merganser.)

Tubenoses (Procellariiformes)

The albatrosses (*Diomedea* sp.), and the shearwaters and fulmars (Procellariidae), all members of the order Procellariiformes, share the same offshore niche along the outer coast. The albatross represented at Yaquina Head is probably the short-tailed albatross (*Diomedea albatrus*), which is nearly extinct today. It was reported on the Oregon coast in the 19th and early 20th centuries, and specimens have been identified from shell mounds in coastal Tillamook and Lincoln Counties (Gabrielson and Jewett 1970:81).

Albatross and shearwaters are birds that do not light on land or very near to shore. They are not listed as having been observed at Yaquina Head by either the OSU Marine Science Center report (Bureau of Land Management 1983:14) or the USDA Biological Survey files. The tubenoses are summer migrants to Oregon.

Cormorants (Phalacrocorax sp.)

Cormorants are large, fish-eating aquatic birds that belong to the same order (Pelecaniformes) as pelicans. Although specific identifications were not possible, there appear to be at least three species of cormorant represented in the midden at 35LNC62, the double-crested cormorant (*P. auritus*), Brant's cormorant (*P. penicicillatus*), and the pelagic cormorant (*P. pelagicus*). All three of these birds are common users of the Yaquina Head area throughout much of the year, and Brant's cormorant and the pelagic cormorant both breed there (Bureau of Land Management 1983:14).

Shorebirds, gulls, and alcids (Charadriiformes)

The Charadriiformes are a large and diverse group of wading or swimming birds. A number of representatives of this group commonly breed and/or winter at Yaquina Head (Bureau of Land Management 1983: 14).

Four families of shorebirds are recorded as using the the Yaquina Head area, but only one of these families, the sandpipers (Scolopacidae), is represented in the faunal assemblage from the site. Although some sandpipers are upland and freshwater species, most occupy the ocean shore habitat. Sandpipers are highly migratory birds, and the western sandpiper (*Ereunetes mauri*), which is listed in the OSU Marine Science Center report as an occasional migrant in the Yaquina Head area, is an abundant spring and fall migrant on the Oregon coast (Gabrielson and Jewett 1970:264-265).

Gulls (Larinae) are aquatic birds that are primarily scavengers. They are very common along the Oregon coast, and at least seven species are known to utilize the Yaquina Head area; two of those species nest there (Bureau of Land Management 1983:14). Although species identifications were not possible for the archaeological specimens recovered, a large percentage of the specimens classified as Larus sp. are of a size comparable to L. glaucescens, the glaucous-winged gull. This gull commonly breeds and winters at Yaquina Head. A few specimens were identified as terns; the common tern (Sterna hirundo) and the arctic tern (S. paradisaea) are uncommon visitors to the Yaquina Head area (Bureau of Land Management 1983:14).

Auks and their relatives (Alcidae), including murres, murrelets, and auklets, are pelagic birds that generally come ashore only to breed (Robbins et al. 1966:148). The common murre (Uria aalge) breeds at Yaquina Head and is also a common year-round resident of the area. The rhinoceros auklet (Cerorhinca monocerata) also breeds at Yaquina Head, although in much smaller numbers than the common murre, and is an occasional winter visitor to the area. The marbled murrelet, (Brachyramphus marmoratum), is an occasional summer resident of the Yaquina Head area (Gabrielson and Jewett 1970:311,314,317; Bureau of Land Management 1983:14).

Loons (Gavia sp.)

The loons are powerful diving birds that come ashore only to breed and nest. The three species that are present in Oregon all are winter residents in the Yaquina Head area, the common loon (G. immer) being a common resident, and the arctic (G. arctica) and red-throated (G. stellata) loons being uncommon (Bureau of Land Management 1983:14). The common loon has been recorded in Lincoln County during every month of the year, but the arctic and red-throated loons are primarily winter residents (Gabrielson and Jewett 1970:64-69). The specimen from 35LNC62 identified as small loon (Gavia sp.) is either arctic or red-throated loon.

SUMMARY

Analysis of the vertebrate faunal remains indicates that the prehistoric inhabitants of 35LNC62 broadly exploited the rich and varied resources available in the vicinity of Yaquina Head. Marine mammals, large terrestrial mammals, fish, and birds were all utilized, and were obtained from a number of different habitats in the headland area. Fish were obtained from the nearshore rocky intertidal zone, from the nearshore rocky reefs, and possibly from habitats farther from shore.

Birds were obtained from terrestrial, shoreline, and marine habitats, including, evidently, the outer coastal zone. Marine mammals were obtained both on shore and from offshore rocks, and possibly from open, outer coastal waters as well. The presence in the cultural deposits of the remains of sea mammals, offshore birds, and fish commonly found on offshore reefs, suggests that seagoing watercraft were most likely employed in the subsistence activities carried out from this site.

The vertebrate faunal remains from Yaquina Head contain many indicators of the season of occupation; these data strongly suggest that the site was inhabited throughout the year. A full discussion of seasonality, as well as comparisons between strata and interpretations of the faunal data, is included in Chapter 9 of this volume.

CHAPTER 6

HUMAN SKELETAL REMAINS

by Brian E. Hemphill

Two human burials were encountered during the excavations at Yaquina Head. The first burial, designated Feature 5, consisted of the skeletal remains of an infant. The second burial, designated Feature 11, was that of an adult. Both burials were situated in proximity to the cliff face and thus were threatened with imminent destruction by erosion. In view of this situation, the Sacred Lands Committee of the Confederated Tribes of Siletz Indians requested that the burials be recovered and turned over for reinterment. In this chapter, descriptive information on the two burials recovered from Yaquina Head is presented. The two sets of human skeletal remains were reinterred on the Siletz Reservation on September 15, 1986.

BURIAL 1

Location

Burial 1 (Feature 5) was the skeleton of a small infant encountered near the bottom of Unit C along the edge of the cliff face. An unusual whale bone artifact was situated just above the human skeletal remains. The burial was in a shallow pit, the bottom of which was 120 cm below the surface. The pit appeared to have been dug into Stratum 3 sediments from Stratum 1. A fragment of the whale bone artifact submitted for radiocarbon analysis yielded a date of 3400 ± 240 years BP.

Burial Position

The human skeletal remains in this burial were found in various states of disarticulation. From the position of the bones recovered during the course of the excavations, it appeared that this individual was interred in a shallow pit. The position of the long bones of the lower limb suggested that this individual was placed in a seated position with the lower leg flexed under the thigh. This conclusion was supported by the position of the left tibia and fibula as well as the left calcaneus. The location of the right innominate fragment, the right femoral fragment, and the left femur strongly suggest that the trunk was located in the southeast portion of the pit.

The bones of the upper limb were in a greater state of disarticulation than those of the lower limb. The bones of the upper limb were poorly preserved, but those fragments which were recovered--right radius, right ulna, left humerus, and left ulna--suggest that the arms were highly flexed toward the pelvis. The location of the right scapula and the ribs suggests that the upper body was bent over double in a northwest/southeast orientation.

All of the features of the interment of the skeletal remains contained in Burial 1 suggest that this individual was buried in a fully articulated condition. The body was placed in a seated position with the trunk in the southeast portion of the shallow pit. The upper body was bent over the lower limbs in a northwest direction. Although no cranial fragments from this individual were recovered, the location of the bones of the upper limb suggest that the head had been located in the northwest portion of the pit.

Condition and Preservation

Preservation of the skeletal remains in Burial 1 varied among the different portions of the skeletal system (Table 6-1). The preservation of the axial skeleton was rather poor, especially with regard to the pelvis where only a portion of the right ilium was preserved. A total of 22 rib fragments was recovered, from which nine right ribs including R1 and seven left ribs were identified. Preservation of the cranium was extremely poor, as no fragments of either the neurocranium, splanchnocranium, or mandible were recovered. The lack of preservation of these elements in such an individual as was found in Burial 1 is not unusual considering the extreme thinness and lack of coalescence of these portions of the skeletal system early in life (Krogman 1961).

The upper extremity and pectoral girdle were represented by nine fragments, the most complete of which were the left humerus and right scapula. While the proximal portion of the upper extremity was moderately well preserved (with the exception of the right humerus and left scapula), the preservation of the lower arm and hands was much less complete. The difference in preservation of the upper limb can be explained both by the lack of ossification of the carpal elements in very young individuals (Flecker 1932-1933) and by the decreased percentage of cortical bone in the radii and ulnae.

In marked contrast to the axial skeleton and upper extremity, preservation of the lower limb was quite good (Table 6-1). The lower limb was represented by 10 skeletal fragments. The left femoral diaphysis was complete, while the right and left tibiae, as well as the right and left fibulae, although fractured post-mortem, represented the complete diaphyses. Of the feet, only the left calcaneus and one pedal phalange were recovered.

Table 6-1. Inventory of bones from Burial 1.

Skeletal Elements	Number Recovered		
I. Axial Skeleton			
A. Ribs			
Right (including R1)	9		
Left (4 associated with thoracic vertebrae)	7		
Unidentifiable		11	
Total Rib Fragments			27
B. Vertebrae			
Vertebral bodies complete	4		
Vertebral bodies only	3		
Laminae and Spinous Processes	7		
Total Vertebral Fragments		14	
C. Pelvis			
Right ilium	1		
Total Pelvic Fragments		1	
TOTAL AXIAL SKELETON FRAGMENTS			42
II. Upper Extremity			
A. Right			
Right scapula	1		
Right ulna (medial fragment)	1		
Right radius (distal fragment)	1		
Total Right Upper Extremity Fragments		3	
B. Left			
Left humerus	1		
Left ulna (proximal fragment)	1		
Left ulna (distal fragment)	1		
Total Left Upper Extremity Fragments		3	
C. Hand phalanx		3	
TOTAL UPPER EXTREMITY FRAGMENTS			9

Table 6-1 (continued)

Skeletal Elements	Number Recovered		
III. Lower Extremity			
A. Right			
Right femur (proximal fragment)	1		
Right femur (medial fragment)	1		
Right tibia (proximal fragment)	1		
Right tibia (distal fragment)	1		
Total Right Lower Extremity Fragments		4	
B. Left			
Left femur	1		
Left tibia (proximal fragment)	1		
Left tibia (distal fragment)	1		
Left fibula (proximal fragment)	1		
Left fibula (distal fragment)	1		
Total Left Lower Extremity Fragments		5	
C. Pedal phalange		1	
TOTAL LOWER EXTREMITY FRAGMENTS			10
IV. Unidentifiable Fragments			15
TOTAL SKELETAL FRAGMENTS RECOVERED			76

Age at Death

The conformation and length of the long bones of the individual interred in Burial 1 strongly suggest that this individual died very near birth. It is possible to determine the age at death of a foetus or newborn by the diaphyseal length of the long bones (Stewart 1979). This is possible because long bone length has a high correlation with overall stature, usually between 0.986 and 1.00 (Olivier and Pineau 1960). It has been demonstrated that the increase in overall stature as well as mean crown-rump length throughout the entire period of gestation is linear (Stewart 1954; Olivier and Pineau 1960; Fazekas and Kosa 1966). Using very different populations ranging from Eskimos, protohistoric American Indians, to contemporary European populations, it was found that the mean length of the femoral diaphysis at birth varied less than 7 mm. Despite tremendous variation in maternal health during pregnancy, as well as variation in specific age (in lunar months) of the foetus at birth, this high degree of uniformity in femoral length at birth offers a strong argument for a high level of genetic control of foetal development and the birth process.

All demographic analyses have demonstrated high levels of mortality at birth, followed by slowly declining rates thereafter. In light of this demographic data, knowledge of long bone length of neo-natal juveniles is essential for accurately determining the age at death. To determine whether the death of the individual contained in Burial 1 was pre-natal or post-natal, the length of the femoral diaphysis was compared to the results of a study on 44 foetal femora (Olivier and Pineau 1960). The left femoral diaphyseal length of Burial 1 was 78.2 mm (Table 6-2), which strongly suggests that this individual had developed over a period of at least ten lunar months, and that the individual contained in Burial 1 suffered a post-natal death.

Comparison of the diaphyseal lengths of the long bones from Burial 1 with standards developed for newborn long bone length from the protohistoric Arikara skeletal series from Mobridge, South Dakota, tabulated by Merchant and Ubelaker (1977) and compiled by Stewart (1979) show strong similarities. The differences between Burial 1 (Table 6-2) and the Arikara series range from 0.6 mm for the humerus to 3.2 mm for the femur (Table 6-3). A comparison of the femoral difference between Burial 1 and the Arikara series (Table 6-4) reveals that the diaphyseal length of Burial 1 falls in the class interval which contained the highest percentage (52.1%) of all Arikara newborns. In addition, all of the long bone diaphyseal lengths easily fall within the range observed by Stewart for Arikara newborns. These data strongly indicate that the individual contained in Burial 1 died either at birth or shortly thereafter.

Sex and Stature

The determination of the sexual affiliation of infants and juveniles is very difficult. This situation is largely due to the fact that those characteristics of the skull (browridges, mastoid processes, muscle markings, etc.) and the pelvis (ischio-pubic index, pubis shape, pre-auricular sulcus, etc.) develop later in life as a result of hormonal changes which bring about a whole suite of secondary sex characteristics. As a result, attempts to distinguish the sex of pre-adolescent skeletal remains are rarely made.

Stature of newborn individuals can be calculated with a much higher degree of reliability than sexual affiliation. Following Olivier and Pineau's (1960) method, use of the right tibial diaphysis

Table 6-2. Osteological measurements from Burial 1.

Measurement	Value
I. Upper Extremity Measurements	
A. Left Humerus	
Total length	66.6 mm
Proximal M-L	12.7 mm
Proximal A-P	8.7 mm
Mid-shaft M-L	5.1 mm
Midshaft A-P	5.6 mm
Distal M-L	15.3 mm
Distal A-P	6.4 mm
Height of olecranon fossa	4.0 mm
Width of olecranon fossa	4.6 mm
B. Left Ulna	
Length of olec. process	8.0 mm
Width of olec. process	4.5 mm
Height from top of olec. to bottom of ulna	8.7 mm
Height from bottom of olec. to bottom of ulna	7.2 mm
C. Right Ulna (fragmentary)	
Total length	4.2 mm
M-L midshaft	4.4 mm
A-P midshaft	3.9 mm
D. Right Radius (fragmentary)	
Total length	3.3 mm
M-L midshaft	4.4 mm
A-P midshaft	3.9 mm
Distal M-L	4.0 mm
E. Right Scapula	
Total height	36.2 mm
Sub scapular height	31.1 mm
Acromion length	33.5 mm
Height of glenoid fossa	13.3 mm
Width of glenoid fossa	6.1 mm
Length of lateral border from inferior apex to lowest point on glenoid fossa	22.6 mm
F. Medial Phalange	
Total length	11.0 mm
Midshaft M-L	3.9 mm
Midshaft A-P	2.1 mm
G. 2nd Medial Phalange	
Total length	10.2 mm
Midshaft M-L	3.4 mm
Midshaft A-P	2.0 mm
II. Lower Extremity Measurements	
A. Right Innominate	
Acetabular height	24.7 mm
Acetabular width	11.1 mm
S.I. platform height	14.6 mm
S.I. platform breadth	13.2 mm
II. Lower Extremity Measurements (continued)	
B. Left Femur	
Total length	78.2 mm
Maximum proximal M-L	broken
G. Troch. to femoral head (inc)	13.7 mm
Mid-shaft M-L	7.5 mm
Mid-shaft A-P	5.6 mm
Distal femur maximum M-L	21.4 mm
Distal femur maximum A-P	11.7 mm
Length from distal femur to nutrient foramen	32.9 mm
C. Left Tibia	
Total length	67.6 mm
Mid-shaft A-P	7.6 mm
Distal A-P	9.7 mm
Distal M-L	9.7 mm
Proximal M-L	15.7 mm
Proximal A-P	12.6 mm
A-P at T.T.	11.0 mm
D. Left Fibula	
Total length	65.4 mm
Distal M-L	4.5 mm
Distal A-P	5.4 mm
Mid-shaft A-P (approx.)	3.3 mm
Mid-shaft M-L (approx.)	3.3 mm
Proximal M-L	5.9 mm
Proximal A-P	4.6 mm
E. Right Femur (fragmentary)	
Proximal femoral length	16.4 mm
From greater trochanter to femoral head	8.6 mm
AP at top of LA	7.5 mm
Right distal femur ML	9.6 mm
Right distal femur AP	7.8 mm
Right distal femur length	17.8 mm
F. Right Tibia	
Length	69.1 mm
ML width	16.2 mm
Proximal breadth	10.7 mm
Mid-shaft A-P	6.7 mm
Mid-shaft M-L	6.5 mm
Length from top proximal tibia to nutrient foramen	8.4 mm
Distal tibia-ML breadth	10.7 mm
Distal tibia-AP breadth	10.8 mm
G. Right Fibula (fragmentary)	
Length	51.7 mm
AP of proximal articulation	4.1 mm
Mid-shaft A-P	3.3 mm
Mid-shaft M-L	3.2 mm
H. Proximal Phalanx M1	
Total length	12.7 mm
Proximal M-L	5.4 mm
Proximal A-P	4.6 mm
Distal M-L	4.9 mm
Distal A-P	4.6 mm
Mid-shaft M-L	4.0 mm
Mid-shaft A-P	4.1 mm

Table 6-3. Comparison of long bone diaphyseal lengths from the protohistoric Arikara skeletal series with diaphyseal lengths from Burial 1.

Diaphysis length	Arikara series	Range	Burial 1	Difference from Arikara mean
Femur	75.0 mm	73.5-81.5 mm	78.2 mm	3.2 mm
Tibia	67.0 mm	63.0-74.5 mm	68.35 mm*	1.35 mm
Fibula	63.0 mm	60.0-69.5 mm	65.4 mm	2.4 mm
Humerus	66.0 mm	63.5-71.5 mm	66.6 mm	0.6 mm

* Average of right and left tibiae

from Table 1 yields a stature estimate of 53.5 + 1.92 cm. Use of the left humeral diaphysis yields a stature estimate of 52.4 + 1.8 cm. These results serve to confirm the age at death estimate of ten lunar months derived from the femoral diaphysis and strongly indicate that both the upper and lower limb bones from Burial 1 represent remains of a single individual.

BURIAL 2

Location

Burial 2 (Feature 11) was exposed in the cliff face immediately north of Unit C. This burial was encountered while profiling the exposed strata along the cliff face, and was situated at a depth of 110-120 cm below surface.

Burial Position

Burial 2 was a fully articulated adult resting in a supine position oriented from northeast to southwest. From the location of the occipital and the frontal it appears that the body was interred with the head in the northeast with the face turned east. The right arm was fully extended parallel to the body, while the left arm was fully extended with the hand placed in the pelvic region. The trunk was tilted to the east and the legs were both semi-flexed to the east as well. The right leg was flexed at 17 degrees and the left leg was flexed at 19 degrees. Both of the knees were semiflexed to the west, the right knee at 37 degrees and the left knee at 39 degrees.

Table 6-4. Frequency distribution of femur lengths in the 62.5-100-mm range: Arikara (from Stewart 1979:132).

Class Intervals*	No.	Percent
62.5-65	3	3.1
65.5-70	1	1.0
70.5-75	19	19.8
75.5-80	50	52.2
80.5-85	12	12.5
85.5-90	5	5.2
90.5-95	3	3.1
95.5-100	3	3.1
Totals	96	

* Average = 77.5 ± 4 mm

Condition

Burial 2 was represented by a total of 89 skeletal fragments, attesting to moderate to good preservation of the entire skeleton (Table 6-5). The axial skeleton was generally in poor condition. The spinal column was represented by the atlas (C1), the axis (C2), four other cervical vertebrae and four poorly preserved thoracic vertebrae. The ribs were moderately well preserved and quite fragmentary. A total of 35 rib fragments were recovered representing seven left ribs and six right ribs. Neither R1, R2, R11, nor R12 were present on either side. Elements of the lumbar vertebrae, sacrum, and pelvis were in an extreme state of degeneration and could not be removed without disintegration.

In contrast, portions of the skull were well preserved (Table 6-5). The neurocranium was well preserved although fragmentary. The splanchnocranium was less well preserved. The left and right maxilla were present and presented a complete upper dentition, except for LI1 and LI2. The condition of the alveoli for both of these teeth indicated that their loss was due to post-mortem factors. The mandible was broken into three pieces, but these pieces presented a complete lower dentition, except for RI1, LPM4, and RM3. RI1 was lost post-mortem, but LPM4 was clearly lost before death. Ante-mortem loss of LPM4 was evident because the alveolus was completely healed, and the molars on the left side had experienced an observable degree of mesial drift. Whether RM3 was absent because of ante-mortem loss or because of congenital absence was difficult to determine without the assistance of radiographs. The lack of evidence of a healed alveolus, the moderate attrition of RM1, and the lack of a distal wear facet on RM2 all suggest that the lack of RM3 in this individual was due to congenital absence rather than to ante-mortem loss.

Table 6-5. Inventory of bones from Burial 2.

I. Axial Skeleton			
A. Skull			
Frontal	1		
Maxilla (left and right)	2		
Sphenoid	1		
Temporal (left and right)	2		
Right Parietal	1		
Mandibular corpus (left and right)	2		
Left Ascending Ramus	1		
Occipital	1		
Total Cranial Fragments		11	
B. Vertebral Column			
Atlas (C1)	1		
Axis (C2)	1		
Cervical Vertebrae	4		
Thoracic Vertebrae	4		
Total Vertebral Segments		10	
TOTAL AXIAL SKELETON FRAGMENTS			21
II. Upper Extremity			
A. Right			
Humerus (distal)	2		
Ulna (proximal and medial)	3		
Radius (proximal and medial)	3		
Hamate	1		
Scaphoid	1		
Trapezoid	1		
Metacarpals (2nd, 3rd, 4th, 5th)	4		
Phalanges (three proximal, three medial, two distal)	8		
Total Right Upper Extremity Fragments		23	
B. Left			
Humerus (complete except for medial epicondyle)	1		
Ulna (proximal and medial)	2		
Radius (proximal and medial)	3		
Clavicle (distal only)	1		

Table 6-5 (continued)

II. Upper Extremity (continued)			
Scapula (glenoid fossa and acromion)	2		
Metacarpals (1st, 2nd, 3rd)	3		
Phalanges (one proximal, two medial)	3		
Total Left Upper Extremity Fragments		15	
TOTAL UPPER EXTREMITY FRAGMENTS			38
III. Lower Extremity			
A. Right			
Femur (medial and distal)	2		
Tibia (proximal, medial, and distal)	3		
Fibula (proximal and distal)	2		
Calcaneus	1		
Talus	1		
Navicular	1		
Cuboid	1		
Third Cuneiform	1		
Metatarsals (1st and 3rd)	2		
Total Right Lower Extremity Fragments		14	
B. Left			
Femur (proximal, medial, condyle)	3		
Tibia (proximal and medial)	2		
Fibula (central)	2		
Patella	1		
Calcaneus	1		
Talus	1		
Novicular	1		
1st Cuneiform	1		
Metatarsals (1st, 2nd, 3rd, 4th)	4		
Total Left Lower Extremity Fragments		16	
TOTAL LOWER EXTREMITY FRAGMENTS			30
TOTAL SKELETAL FRAGMENTS RECOVERED			89

The upper extremity was well preserved although fragmentary. The only complete element of the upper extremity and pectoral girdle was the left humerus, which lacked only a fragment of the medial epicondyle. All other long bones of the upper extremity and pectoral girdle were represented except for the right scapula and right clavicle. The lower arm was less well preserved than the two humeri, the proximal portions were present in both of the radii and ulnae but the distal articulations were absent.

The two hands were subject to differential preservation. The left hand was poorly preserved, none of the carpals was present, but the first, second, and third metacarpals were recovered as well as three phalanges, one proximal, and two medial. The right hand was better preserved than the left. Of the carpals, the hamate, scaphoid, and lunate were present, as were the second, third, fourth, and fifth metacarpals. A total of eight phalanges were recovered from the right hand, three proximal, three medial, and two distal.

The long bones of the lower limb were also well preserved, but like those of the upper limb were rather fragmentary. The right leg included all three of the long bones. The femur was in three pieces, the tibia was in three, and the fibula was broken into two nearly equal parts. The left leg also included all three of the long bones, as well as the patella which was absent on the right side. The left femur was represented by three fragments: proximal, medial, and a portion of the lateral condyle. The tibia was only represented by two small proximal fragments, and the left fibula was recovered in only two central fragments.

The feet were relatively well preserved. The right foot was represented by the calcaneus, talus, navicular, cuboid, and the third cuneiform, as well as the first metatarsal. The left foot was similarly preserved, as the calcaneus, talus, navicular, and first cuneiform were recovered as well as the first and third metatarsals. The pedal phalanges were curiously absent from this individual, but it should be noted that the distal portions of the metatarsals were in a bad state of preservation, thus suggesting that the lack of pedal phalanges was due to differential preservation, rather than to any pathological or traumatic agent.

Determination of Sex

The determination of the sexual affiliation of the individual interred in Burial 2 can be based upon both morphological and metrical criteria. Examination of the morphological features of the cranium suggested maleness, but of a rather gracile build. The supraorbital margins presented a rather rounded conformation, while the supraorbital ridges were only moderately developed. There was no development of either the parietal or frontal bosses commonly observed in females. The occipital region presented rather marked superior and inferior nuchal lines and the external occipital protuberance was well marked. In the temporal region, the zygomatic processes were well developed and presented a degree of flare commonly observed in crania of Mongoloid affiliation. The posterior root of the zygomatic process was rather robust and extended over the external auditory meatus, resulting in the supra-meatal crest. This feature has been identified in a series of South African Cape Colored individuals as common in males but usually absent in females (Keen 1950).

The mastoid processes were well developed and pyramidical in shape, confirming the robusticity observed in the zygomatic arch. The height of the right mastoid process was 29 mm while the height of the left mastoid process was 29.5 mm. According to Keen (1950), any measurement of mastoid height above 22 mm is probably male, while a measurment of 29 mm falls right on the mean value for males in his study. The temporal lines were moderately developed, especially in the anterior aspect. The mandible presented the "squared off" mental eminence, a feature commonly seen in males but rarely observed in females. •

In considering the post-crania, the pelvis is usually the best indicator of sex (Stewart 1979; Brothwell 1981). Unfortunately, the pelvic region of the individual interred in Burial 2 was too damaged for adequate determination to be made. In the absence of adequate pelvic remains, the next best skeletal indicators for sexual affinity are the height of the glenoid foss of the scapula, the vertical height of the proximal head of the humerus, and the maximum diameter of the proximal head of the femur (Stewart 1979). The glenoid fossa of the left scapula in Burial 2 was 41 mm (Table 6-6). Based upon a frequency distribution of glenoid fossa height of 50 right scapulae from the Terry Collection (Stewart 1979), a measurement of 41 mm clearly places Burial 2 in the male range (Figure 6-1).

The vertical height of the proximal head of the left humerus from Burial 2 measured 44 mm; such a measurement falls toward the lower end of the male range and the upper end of the distribution of females based upon the 400 humeri in the anatomy collection at Harvard University (Dwight 1905). The vertical diameter of the proximal head of the proximal femur of Burial 2 was found to be 46 mm. According to Pearson (1917-1919), a measurment of 46 mm for the vertical height of the proximal head of the femur is definitely indicative of males. This conclusion is also supported by the results of Dwight's (1905) analysis of the femora of 200 males and 200 females in the Terry Collection.

The post-crania was marked by rather moderate muscle markings. The linea aspera of the femur was only moderately raised. Calculation of the platymeric index, which compares subtrochanteric sagittal and transverse diameters yielded the index value of 76.4, clearly platymeric or flattened. The platcnemic index of the tibia, which compares sagittal and transverse cnemic diameters, was calculated, and an index value of 62.5 was achieved. Such a value is classified as platycnemic or very flat (Krogman 1961; El-Najjar and McWilliams 1978).

Thus, Burial 2 would appear to be of a male. Evidence of this sexual diagnosis is based most strongly upon the morphological features of the skull as well as the measurements of the height of the glenoid fossa of the left scapula, the height of the right and left mastoid processes, and the vertical height of the proximal head of the left femur. None of the metrical indicators suggested that the individual interred in Burial 2 was female, although the vertical height of the proximal humerus fell within the range of overlap between males and females. Therefore, it can be stated with some degree of confidence that Burial 2 was of a male, albeit of a rather gracile build.

Table 6-6. Osteological measurements from Burial 2.

I.	Cranial Measurements	
	A. Minimum frontal diameter	99 mm
	B. Length of the right mastoid	29 mm
	C. Length of the left mastoid	29.5 mm
II.	Upper Extremity Measurements	
	A. Total length of left humerus	311 mm
	B. Mid-shaft A-P left humerus	21 mm
	C. Mid-shaft M-L left humerus	23 mm
	D. Head diameter of left humerus	44 mm
	E. Circumference of proximal head of left radius	25 mm
	F. Glenoid fossa height of left scapula	41 mm
	G. Glenoid fossa width of left scapula	29 mm
III.	Lower Extremity Measurements	
	A. Proximal head diameter of left femur	46 mm
	B. Subtrochanteric A-P of left femur	26 mm
	C. Subtrochanteric M-L of left femur	34 mm
	D. Mid-shaft A-P of left femur	33 mm
	E. Mid-shaft M-L of left femur	27 mm
	F. Mid-shaft A-L of left tibia	36 mm
	G. Mid-shaft M-L of left tibia	22.5 mm

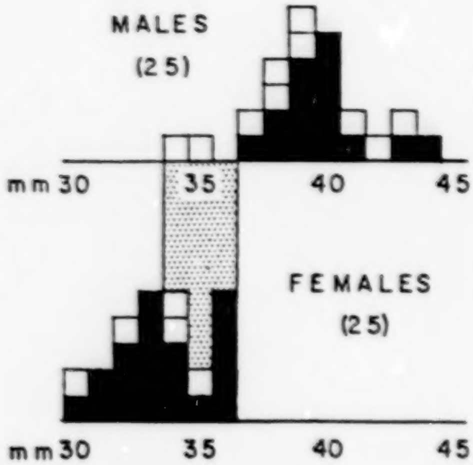


Figure 6-1. Sex distributions of glenoid-cavity lengths of 50 right scapulae from the Terry Collection. White squares = Whites (10 males, 5 females); black squares = Blacks (15 males, 20 females); stippling = overlap (from Stewart 1979:98).

Age at Death

In light of the short period of time allowed for analysis, the determination of age at death is less precise than desired. Visual observation of the epiphyses of the long bones confirmed that all of the long bones of the individual contained in Burial 2 were fully ossified. This suggests a minimum age at death of 23 years (Krogman 1961). This age estimate is supported by the fully ossified condition of the presacral vertebral column which, according to the study of White males by McKern and Stewart (1957), is not achieved until at least 24 years of age. The striations, or "billows," on the superior and inferior aspects of the vertebral bodies were clearly absent from those vertebrae which were well enough preserved to be assessed. Such striations do not usually begin to disappear until at least the twenty-third year (McKern and Stewart 1957).

In analyzing those ribs which were recovered, six from the right and seven from the left, it was observed that all of them presented fully ossified heads and tubercles. Such fusion of the rib head and tubercle to the rib body is not normally completed until the age of 25 (Girdany and Golden 1952). In addition, it has been observed that the last ribs to ossify are ribs four through nine, all of which where bilaterally represented in Burial 2 (Girdany and Golden 1952). The medial epiphysis of the clavicle usually does not fuse until the age of 30 (Krogman 1961), thus providing an important age marker during this point in life. Unfortunately, the medial aspect was absent from the only clavicle (left) present from Burial 2.

Since the pubic symphysis was not preserved, nor was there any evidence of degnerative bone disease, ectocranial suture closure was used to give some estimate of age at death. It should be noted from the outset that there are a number of problems with the use of ectocranial suture closure for the estimation of age at death. These problems include: observer differences in grading the degree of closure into discrete categories, variation in closure patterns among individuals of the same population (not to mention differences in suture closure among members of very different populations), and the phenomena of "lapsed union."

First identified by Cobb (1952), the "lapsed union" effect can result in the delay and even complete arrestment of normal suture closure in individuals which appear completely healthy in all other respects. With these limitations in mind, the data from Burial 2 (Table 6-7) reveal that there was complete closure of the sagittal and coronal 1 and 2 sutures, while lambdoid 1, 2, and 3 were nearly completely closed. All other cranial sutures were either completely open or in the initial phase of closure. When compared with the data of Todd and Lyon (1925) derived from 267 Caucasian and 79 Black male skulls in the Todd collection, the degree of ectocranial suture closure suggests an age at death for Burial 2 at some point in the late twenties, but probably before the age of 30.

Table 6-7. Cranial suture closure in Burial 2 (comparative data adapted from Todd and Lyon 1925).

Suture	Age at Commencement*	Age at Termination*	Burial 2**
1. Sagittal	20	29	4
2. Sphenofrontal orbital	28	46	1
3. Sphenofrontal temporal	28	38	1
4. Coronal 1 & 2	26	29	4
5. Coronal 3	28	50	1
6. Lambdoid 1 & 2	26	30	3
7. Lambdoid 3	26	30	3
8. Masto-occipital	26	33	1
9. Sphenoporrietal	28	38	1
10. Sphenotemporal 2	36	65	0
11. Sphenotemporal 1	37	65	0
12. Mastooccipital	28	32	1
13. Porietamastoid	39	64	0
14. Squamous posterior	38	65	0
15. Squamous anterior	38	65	0

* = Ages in years based upon White males

** = Closure graded on a scale of 0 to 4

The age estimate at death of Burial 2 is broadly supported by the extent of attrition throughout the dentition. Wear is extensive throughout the dentition of Burial 2, but is most marked in the anterior teeth (incisors and canines). The enamel has been completely worn off of these teeth, and secondary dentine has been deposited in order to protect the pulp cavity from invasion. The first molars also exhibit extensive wear, and like the incisors some secondary dentine has been deposited in order to protect the pulp cavity. The third molars were fully erupted and exhibited a moderate degree of wear. This suggests that these teeth had been operational at least several years before death.

The amount of dental attrition is sometimes used to estimate age at death (Miles 1963). While recognizing the dietary differences between Oregon Indians and the population from the British Neolithic studied by Brothwell (1981), use of his tables on the extent of dental attrition nevertheless suggests that the individual interred in Burial 2 died between the ages of 25 and 35. There was no evidence for dental caries in the dentition of this individual, nor was there any evidence of dental abscesses or periodontal disease. This suggests that the ante-mortem loss of LPM4 was due to exposure of the pulp cavity through attrition, rather than through the action of dental caries or periodontal disease.

Therefore, in considering the age at death of the individual contained in Burial 2, it appears from the closure of the epiphyses of the long bones and the full ossification of the presacral vertebral column that this individual was at least 25 years old. This age estimate is supported by the complete ossification of the rib head and tubercles, as well as the degree of dental attrition observed upon the molar teeth. Analysis of ectocranial suture closure suggests an age at death of some point in the late twenties, but probably before the age of 30 (Todd and Lyon 1925). Death before the age of 30 is also suggested by the complete absence of degenerative bone disease. Thus, the individual contained in Burial 2 was of an adult, at least 25 but less than 30 years old at the time of death.

Stature

Stature is usually a relatively easy calculation from skeletal remains and can be performed with a high degree of accuracy. The best bones for the calculation of stature are the femur and tibia. Unfortunately, Burial 2 had only fragments of these bones. While stature may still be estimated from measurements of fragmentary long bones (Steele and McKern 1969; Steele 1970), use of the complete left humerus provides a higher level of accuracy. The total length of the left humerus from Burial 2 is 311 mm (Table VI-6). When applied to the power formula developed by Trotter (1970) for the humeri of Mongoloid males, this value suggests that this individual was between 160.72 cm (5'3") and 169.04 cm (5'6") tall.

SUMMARY

Skeletal remains from two human burials were encountered during the excavations at Yaquina Head. The first set of skeletal remains was from an infant of unknown sex. Comparison of the diaphyseal lengths of the long bones suggests that this individual died either at birth or shortly thereafter. The second set of skeletal remains were from an adult male with a gracile build who is estimated to have been between 160.72 (5'3") and 169.04 cm (5'6") in height. This individual is estimated to have been at least 25 years old, but less than 30 years old at the time of death. As discussed in Chapter 10, the two burials recovered from Yaquina Head appear to be the earliest dated human skeletal remains so far encountered along the Oregon coast.

CHAPTER 7

DESCRIPTION OF ARTIFACTS

by Rick Minor and Robert R. Musil

The artifacts recovered from Yaquina Head include objects made from stone, bone/antler, and shell. Based on the raw materials and the nature of modification, the artifacts were assigned to one of six series. The stone artifacts, which comprise the bulk of the artifact assemblage, are divided into four series: (1) Flake Tools, (2) Cobble Tools, (3) Cores and Debitage, and (4) Abraders. The remainder of the artifact assemblage includes the Bone/Antler and Shell artifacts. The classes of artifacts included in each series, their frequency, and their distribution by strata are summarized in Table 7-1.

The artifacts were catalogued using a simple system that shows in which 1 x 1 m unit, 10 cm level, and depositional stratum each specimen was recovered. According to this system, the unit letter is followed by the level number, the stratum number, and a serial number which consecutively records each artifact within that particular unit, level, and stratum. Thus, projectile point D-6/1-1 was the first artifact from Level 6 of Stratum 1 in Unit D.

FLAKE TOOL SERIES

The artifacts included in this series are generally small implements derived from or consisting of stone flakes. Included in this series are flakes made into tools by means of bifacial and unifacial modification, as well as flakes exhibiting simple use-wear. The dimensions of the flake tools recovered from Yaquina Head are listed in Table 7-2.

Most of the flake tools in the Yaquina Head assemblage are made of chert, which occurs in a variety of colors and textures. Much of this chert was probably obtained in the form of beach pebbles and cobbles. Agate Beach immediately south of Yaquina Head is a likely source of this material. In addition, three artifacts made of basalt and one artifact made of obsidian are also included in the Flake Tool Series. Fine-grained basalt is plentifully available on the cobble beach below Yaquina Head. In contrast, obsidian is only sparsely represented in artifact assemblages from archaeological sites along the Oregon coast, and it is generally assumed that this material was obtained from

Table 7-1. Artifact inventory from Yaquina Head.

	Stratum			Auger Holes	Column Samples	Cut-Bank	TOTAL
Artifact Class	1	2	3				
Flake Tool Series							
Projectile Points							
Stemmed and notched	1						1
Lozenge-shaped		1					1
Drill Tip	1						1
Flake Knives	1	3					4
Bifaces	5	8					13
Scrapers	2	2					4
Gravers	3	3					6
Used Flakes	5	6					11
Cobble Tool Series							
Hammers	2	4					6
Anvils	1	2					3
Grinding Stone	1						1
Choppers	2	1		2			5
Used Cobble Flakes	3	3					6
Core/Debitage Series							
Cores	7	5	1			2	15
Debitage	2321	853	62	68	13		3317
Abrader Series							
Sandstone	20	22					42
Siltstone	1	3					4
Mudstone		1					1
Bone/Antler Series							
Split Bone Awls	1	7					8
Bone Needles		2					2
Bone Wedges		2					2
Carved Whale Bone	1						1
Decorated Bone		1					1
Worked Bone	1	2				2	5
Antler Net Shuttle		1					1
Antler Tine Wedges		2					2
Antler Beam Wedges	1	2					3
Shell Series							
Shell Beads		2					2
TOTAL TOOLS	59	85	1	2	--	4	151
TOTAL DEBITAGE	2321	853	62	68	13	--	3317

Table 7-2. Dimensions of flake tools.

Tool Type	Specimen No.	Measurements Length (mm)	 Width (mm)	 Thickness (mm)	 Weight (g)
Projectile Point	D-6/1-1	36*	22	8	6.7
	B-6/2-1**	34	16	10	4.3
Bifaces	N-6/1-1	54	29	11	10.0
	I-13/1-1	47*	25	11	12.6
	J-14/1-1	48	31	14	17.0
	A-8/2-7	44	26	12	15.1
	B-7/2-2	42	32	17	24.2
	B-8/2-1	42	23	11	10.2
	K-14/2-1	67	30	21	28.5
	N-11/2-2	64	35	15	26.3
Flake Knives	E-9/1-1	40*	32	16	20.0
	E-10/2B-2	44	33*	6	12.8
	I-15/2-2	52	32	11	15.4
	N-10/2-2	41	31	13	13.7
Scrapers	H-8/1-1	23*	25	6	4.6
	C-12/1A-1	28	24*	7	5.7
	D-9/2-1+	47	34	13	19.7
	E-7/2-2	43	40*	16	24.8
Gravers	A-3/1-1	31	15	7	3.3
	E-5/1-1	22*	21*	9	4.0
	N-2/1-1	40	15	13	6.8
	I-15/2-1	32	30	8	8.1
	M-8/2-1	45	30*	10	12.0
	N-12/2B-3	32	26	15	9.3
Used Flakes	H-8/1-2	27	12	4	1.4
	H-8/1-3+	19	16	4	1.4
	K-11/1-1	38	27	10	8.4
	L-11/1-1	61	50	15	35.0
	L-12/1-2	42	36	20	23.6
	I-8/2-1+	28	21	7	5.6
	G-7/2-1	50	27	12	15.5
	I-13/2-1	35	28	4	3.8
	L-16/2B-1	33	23	11	8.0
	M-9/2-1	32	18	8	4.1
	N-12/2B-2	48	43	14	29.8

*Fragmentary aspect

** = obsidian + = basalt

All others are chert.

sources to the east in the upper Willamette Valley and mountains of the Cascade Range.

Projectile Points

Two projectile points, one from Stratum 1 and the other from Stratum 2, were recovered. Two basic styles are represented.

The first specimen (D-6/1-1), made of chert, is a stemmed and shouldered projectile point with shallow corner notches. The tip of this specimen is missing, but the remainder measures 3.6 cm long, 2.2 cm wide, 0.8 cm thick, with a neck width of 1.1 cm (Figure 7-1a).

The second projectile point (B-6/2-1), made of obsidian, is a small lozenge-shaped specimen (Figure 7-1b). It measures 3.4 cm long, 1.6 cm wide, and 1.0 cm thick.

Drill Tip

A single tip fragment from a chert drill (G-5/1-1) was recovered from Stratum 1. This fragment, which exhibits bifacial flaking along its length, is only 1.3 cm long.

Flake Knives

Four chert flake knives were recovered, one from Stratum 1 and three from Stratum 2. These specimens lack the extensive bifacial modification characteristic of artifacts generally classified as knives. Instead, these artifacts consist of flakes which have been bifacially retouched along one side (Figure 7-1c,d). The resulting low-angled cutting edge suggests that these tools served the same function as more extensively modified knives.

Bifaces

Thirteen bifaces were recovered, five from Stratum 1 and eight from Stratum 2. These are bifacially-worked pieces of chert which were never completed into finished tools. Five of these specimens are fragmentary, apparently having been broken during manufacture. The remaining whole specimens are all basically lanceolate in form (Figure 7-1e-h).

Scrapers

Four scrapers were recovered, two from Stratum 1 and two from Stratum 2. Three are made of chert and the other one of basalt

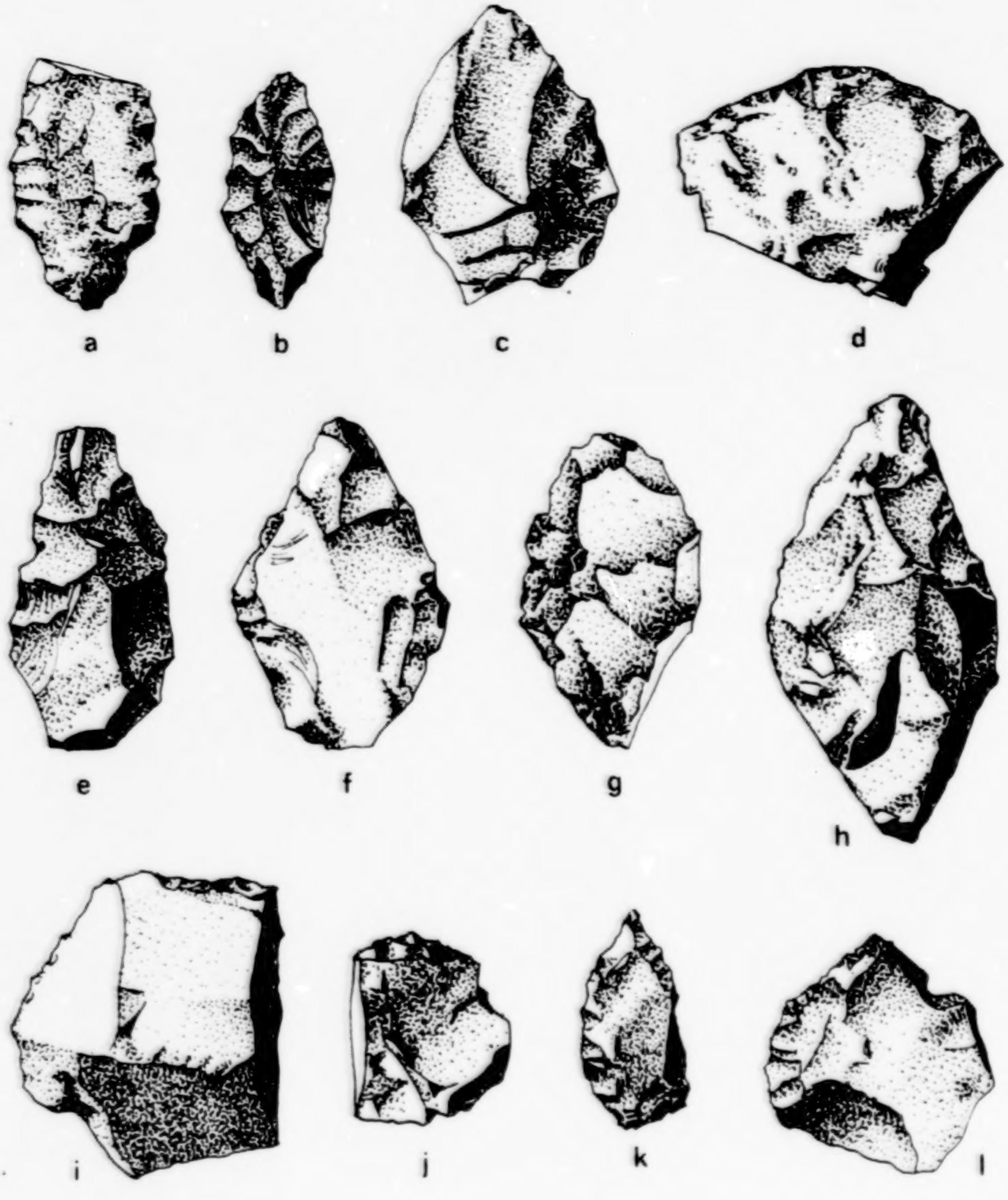


Figure 7-1. Flake tools from Yaquina Head: a-b, projectile points; c-d, flake knives; e-h, bifaces; i-j, scrapers; k-l, gravers (shown actual size).

a. D-6/1-1
b. B-6/2-1
c. N-10/2-2
d. E-9/1-1
e. I-13/1-1
f. J-14/1-1
g. A-8/2-7
h. N-11/2-2
i. C-12/1A-1
j. E-7/2-2
k. A-3/1-1
l. I-15/2-1

(D-9/2-1). These artifacts were modified by unifacial retouch and/or use-wear along one side which resulted in a steep-angled edge suitable for scraping purposes (Figure 7-1i,j).

Gravers

Six chert gravers featuring a sharp beak or spur suitable for graving or incising were recovered, three from Stratum 1 and three from Stratum 2. One graver (A-3/1-1) has been bifacially modified to form a well-defined graver tip (Figure 7-1k). The remaining specimens included in this artifact class exhibit less distinctive beaks or spurs which are associated with other evidence of use-wear (Figure 7-21).

Used Flakes

Eleven flakes were recovered which exhibit evidence of use as simple cutting or scraping tools without any purposeful modification of the working edge. Five were found in Stratum 1 and the other six in Stratum 2. Nine of these used flakes are of chert, while two (H-8/1-3 and F-8/2-1) are of basalt.

COBBLE TOOL SERIES

The Cobble Tool Series consists of implements made of or directly derived from cobbles. Included are implements made by means of flaked stone technology as well as tools characterized by simple battering or use-wear. Although some functional overlap may have existed with artifacts in the Flake Tool Series, the implements in the Cobble Tool Series are always larger and heavier, and clearly indicate a more heavy-duty use than was the case with their smaller counterparts. The dimensions of the cobble tools recovered from Yaquina Head are shown in Table 7-3.

The cobble tools recovered from Yaquina Head are almost all made from basalt cobbles of various sizes. As previously mentioned, basalt cobbles are plentifully available on the beach below the headland. Most of the cobble tools recovered during the excavations appear to have been made from cobbles obtained from this source. A single implement made from a large chert flake (a used cobble flake) and another made of conglomerate (a hammer) are also included in this artifact series.

Hammers

Six cobbles exhibiting evidence of use as hammers were recovered, two from Stratum 1 and four from Stratum 2. Four hammers are rounded

Table 7-3. Dimensions of cobble tools.

		Measurements			
Tool Type	Specimen No.	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Hammers	C-10/1-5	94	82	43	581.6
	C-11/1-4	90	60	51	289.6
	M-7/2-1**	69	60	23	125.7
	M-8/2-2	105	80	37	513.4
	I-16/2B-1	97	64	47	414.1
	L-16/2-2	94	68	49	502.3
Anvil	F-10/2B-1	200	170	65	2.7 kg
Choppers	0-2	111	70	40	648.9
	0-6	90	76	40	398.5
	F-4/1-1	90	72	71	531.4
	C-10/1-2	84	73	29	265.4
	F-8/2-2	64	63	25	125.4
Used Cobble Flakes	D-7/1-1	101	77	30	221.6
	D-8/1-1	62	60	25	114.8
	J-12/1-1	88	34	20	52.6
	G-8/2-1*	71	55	17	62.3
	I-16/2B-3	111	86	32	311.0
	K-15/2-3	225	62	25	375.8

* chert ** conglomerate
All other cobble tools are basalt.

basalt cobbles with similar cortex featuring evidence of battering on their ends or sides (Figure 7-2a). A fifth hammer (C-11/1-4) is a cobble of a somewhat softer basalt which, in addition to evidence of battering on its ends, also features a pit on its one flat surface (Figure 7-2b). The sixth hammer (M-7/2-1) is of conglomerate, and may have seen secondary use as an abrader (Figure 7-2c).

Anvils

One whole and two fragmentary anvil stones were recovered. One fragment was found in Stratum 1, while the others were found in Stratum 2. All three specimens are tabular cobbles with flat surfaces reflecting use as a working surface or anvil in the form of light

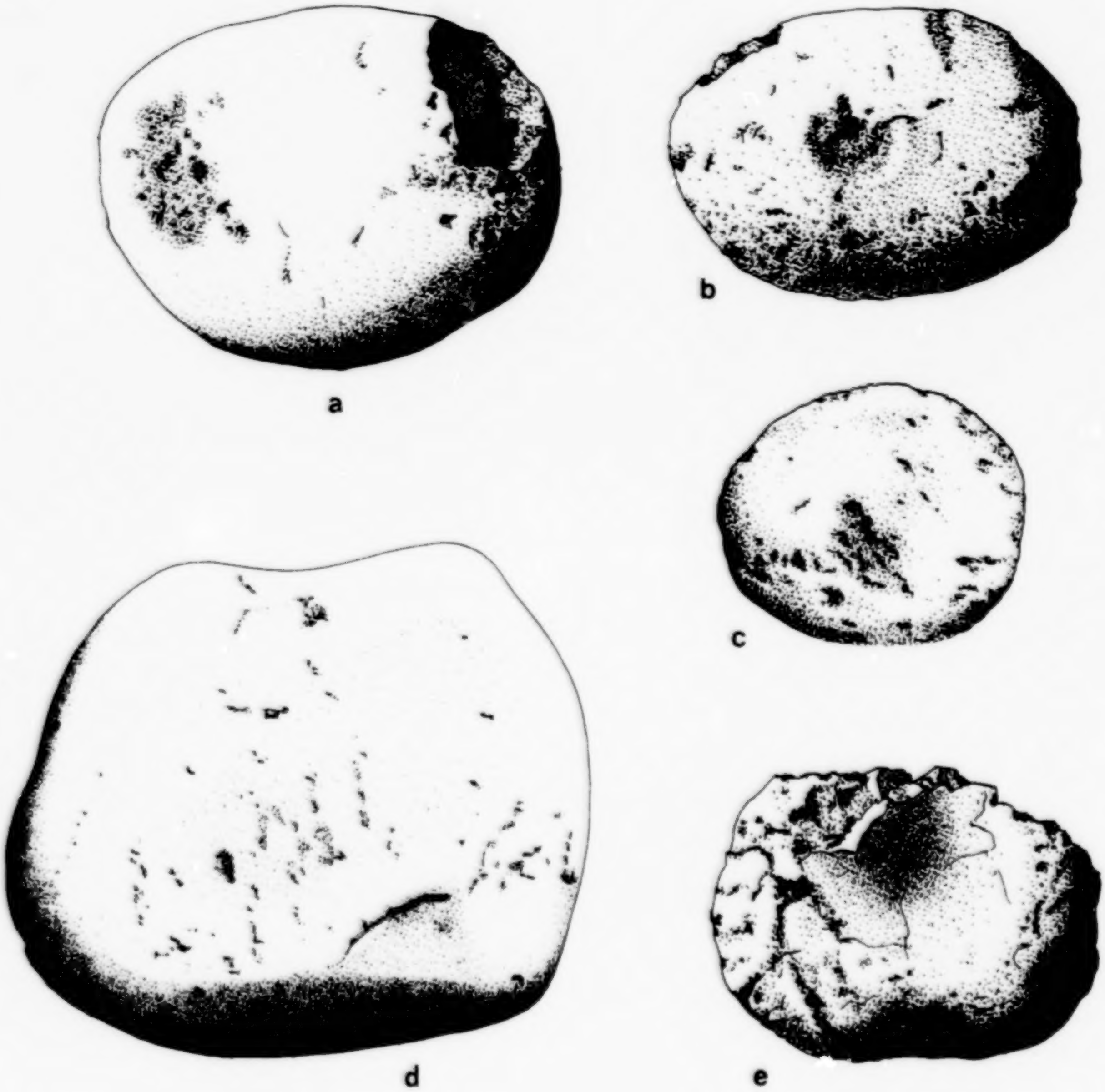


Figure 7-2. Cobble tools from Yaquina Head: a-c, hammers; d, anvil; e, grinding stone (shown 65% actual size except for d. which is 40% actual size).

a. M-8/2-2
b. C-11/1-4
c. M-7/2-1
d. F-10/2B-1
e. I-11/1-1

pecking or abrasion (Figure 7-2d).

Grinding Stone

A fragment of a small grinding stone was recovered from Stratum 1. This implement, made of red coarse-grained basalt, features a shallow depression created as a result of use as a grinding or milling surface (Figure 7-2e). The small size of this specimen suggests that it was more likely used for a specialized task such as grinding pigment than for milling plant foods.

Choppers

Five cobble choppers were recovered, two from Stratum 1, one from Stratum 2, and two from the eroding cliff face immediately north of Units C and D. All five consist of basalt cobbles from which flakes were removed to form edges suitable for chopping or cutting (Figure 7-3a,b).

Used Cobble Flakes

Six cortex flakes struck from large cobbles show evidence of use as cutting, scraping, or graving tools. Three were recovered from Stratum 1 and three from Stratum 2. Four of these tools are flakes struck from basalt cobbles, while a fifth specimen is an elongate piece of tabular basalt. The sixth tool in this class was struck from a large chert cobble (G-8/2-1). Evidence of modification on these implements is limited to minimal flake removals to create sharp edges and use-wear (Figure 7-3c-e).

CORE AND DEBITAGE SERIES

This series consists of the artifacts and waste products resulting from the flake stone tool manufacturing process. Included in this series are cores and lithic debitage.

Cores

Fifteen cores were recovered, seven in Stratum 1, five in Stratum 2, one in Stratum 3, and two from the eroding cliff face immediately north of Units C and D. Thirteen cores are of chert and two of basalt. The chert cores are irregular chunks of lithic material which have had flakes removed in an unsystematic fashion through direct free-hand percussion (Figure 7-3f-i). At least one chert specimen exhibits evidence of battering at opposite ends characteristic of

Table 7-4. Dimensions of cores.

	Measurements			
Specimen No.	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
O-3*	160	132	52	1280.9
O-7	66	60	30	119.7
A-2/1-1	56	48	32	80.0
F-6/1-1	53	50	32	85.5
H-11/1-1	105	81	25	201.6
J-12/1-2	73	63	30	118.8
M-6/1-1	57	42	24	47.2
M-7/1-2	50	37	31	71.8
N-8/1-1*	99	57	57	487.6
A-6/2-1	50	31	26	32.0
B-9/2-1	54	37	23	34.1
D-9/2-1	45	39	32	54.5
H-11/2-1	60	45	28	60.3
N-11/2-1	50	32	19	26.8
D-11/3-1	51	48	26	57.0

* Basalt. All others are chert.

bipolar cores (Figure 7-3j). One chert specimen exhibits heat spalls, which suggest it was subjected to heat treatment to enhance its flaking qualities.

Reduction of basalt cobbles was a major activity at Yaquina Head, but this process primarily involved simply breaking the cobbles into usable fragments. The resulting products of this process were classified as debitage. Only two instances were observed in which basalt cobbles were systematically flaked to result in implements which would fit the traditional definition of a core. One of the basalt cores is little more than a split cobble from which a few flakes have been removed, but the other basalt specimen has been extensively modified to produce well-controlled flakes (Figure 7-3k). The dimensions of the cores recovered at Yaquina Head are listed in Table 7-4.

Lithic Debitage

A total of 3317 pieces of lithic debitage or waste flakes produced as a result of flaked stone tool manufacture was recovered at Yaquina Head. Of these, 13 were recovered in the column samples examined for shell content, 68 were recovered during the auger hole testing program, and the remaining 3236 were recovered during the unit excavations

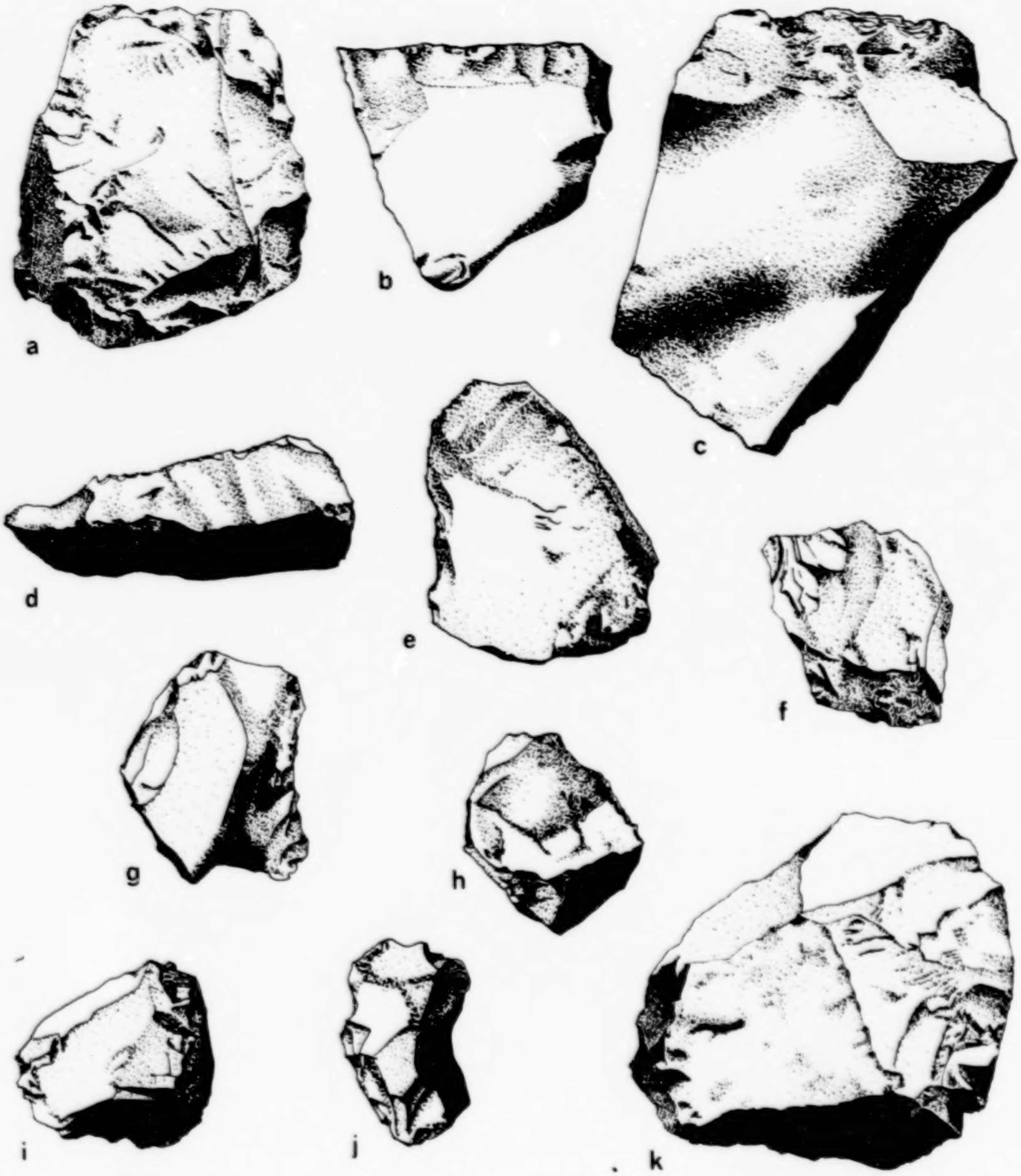


Figure 7-3. Cobble tools and cores from Yaquina Head: a-b, choppers; c-e, used cobble flakes; f-i, chert cores; j, chert bipolar core; k, basalt core (shown 65% actual size except k. which is 40% actual size).

a. C-10/1-2
b. F-8/2-2
c. I-16/2B-3
d. J-12/1-1
e. G-8/2-1
f. H-11-2-1
g. A-2/1-1
h. D-9/2-1
i. D-11/3-1
j. N-11/2-1
k. 0-3

Table 7-5. Tabulation of lithic debitage by raw material and stratum.

	Stratum			Auger	Column	
Raw Material	1	2	3	Holes	Samples	Totals
Obsidian	14 1%	3 <1%	-	-	-	17
Chert	1077 46%	400 47%	44 71%	37 54%	11 85%	1569
Basalt	1226 53%	445 52%	18 29%	31 46%	2 15%	1722
Other	4 <1%	5 <1%	-	-	-	9
TOTAL	2321	853	62	68	13	3317

(Table 7-5). For descriptive purposes, each piece of lithic debitage was first assigned to a general raw material category, either obsidian, chert, basalt, or other (items in the other category all appear to be various forms of schist). Each piece of lithic debitage was then further classified in three ways: (1) in terms of the debitage categories recognized by Sullivan and Rozen (1985); (2) by presence or absence of cortex; and (3) according to size classes. The resulting descriptive data on the lithic debitage from Yaquina Head is summarized in Tables 7-6, 7-7 and 7-8.

The lithic debitage from Yaquina Head is about equally divided between basalt (51.9%) and chert (47.3%), with obsidian (0.5%) and other materials (0.3%) together comprising less than 1% of the collection (Table 7-5). The predominance of basalt and chert is to be expected, as these materials are locally available. Some of the broken basalt cobbles and debitage recovered from the site are identical to materials comprising the beach gravels below the headland. While no chert cobbles were observed in these beach gravels, they are known to be present at the appropriately named Agate Beach immediately south of Yaquina Head. In contrast, the low frequency of obsidian is consistent with the fact that this material is not known to be available locally. The nearest known obsidian sources are to the east in the Upper Willamette Valley and the mountains of the Cascade Range.

In terms of flake classes, the basalt debitage is dominated by flake fragments (64.1%) and complete flakes (26.4%), with debris (7.2%) and broken flakes (2.3%) together making up less than 10%. A similar

Table 7-6. Tabulation of lithic debitage by raw material and debitage class.

	Debitage Class				
Raw Material	Complete	Broken	Fragment	Debris	Total
Stratum 1					
Obsidian	5	1	8	-	14
Chert	363	39	555	120	1077
Basalt	307	26	804	89	1226
Other	-	-	2	2	4
Stratum 2					
Obsidian	2	1	-	-	3
Chert	218	2	151	29	400
Basalt	131	12	272	30	445
Other	-	-	5	-	5
Stratum 3					
Chert	17	3	21	3	44
Basalt	8	-	8	2	18
Auger Holes					
Chert	10	2	18	7	37
Basalt	7	2	18	4	31
Column Samples					
Chert	5	3	2	1	11
Basalt	1	-	1	-	2
Totals:					
Obsidian	7	2	8	-	17
	41.3%	11.7%	47.0%		
Chert	613	49	747	160	1569
	39.1%	3.1%	47.6%	10.2%	
Basalt	454	40	1103	125	1722
	26.4%	2.3%	64.1%	7.2%	
Other	-	-	7	2	9
			77.8%	22.2%	

situation is observed with the chert debitage, with flake fragments (47.6%) and complete flakes (39.1%) predominating, and debris (10.2%) and broken flakes (3.1%) together comprising only slightly more than 13% (Table 7-6). The fact that the flake classes are represented in the same order of frequency suggests that the same types of reduction strategies were applied to both basalt and chert.

According to Sullivan and Rozen (1985), core reduction results in relatively high proportions of complete flakes, debris, and a large percentage of cortex flakes (60-100%), while shaped stone tool manufacture produces comparatively high proportions of flake fragments and broken flakes, with low percentages of cortex flakes (0-20%). The picture that emerges from the classification of the debitage from Yaquina Head, then, is that both core reduction and shaped stone tool manufacture were conducted at this site. The high proportion of complete flakes is consistent with the fact that cobbles from the beach gravels were being broken up during the core reduction process. The high proportion of flake fragments indicates that efforts were also made to shape the materials resulting from the core reduction process into finished tools.

The close similarity in the way in which basalt and chert were

Table 7-7. Presence/absence of cortex on lithic debitage from Yaquina Head.

	Stratum			Auger	Column		
Raw Material	1	2	3	Holes	Samples	Total	%
Obsidian							
Non-cortex	14	3				17	100%
Chert							
Cortex	209	132	7	11	3	362	23.1%
Non-cortex	868	268	37	26	8	1207	76.9%
Basalt							
Cortex	261	123	8	7		399	23.1%
Non-cortex	965	322	10	24	2	1323	76.9%
Other							
Non-cortex	4	5				9	100%

used at Yaquina Head is also indicated in the fact that cortex and non-cortex flakes are represented in identical proportions in the debitage from these lithic materials (Table 7-7). In both cases, cortex is exhibited on 23.1% of the debitage, with the remaining 76.9% lacking cortex. The percentage of cortex flakes observed in the debitage from Yaquina Head falls at the break between Sullivan and Rozen's (1985: 764-765) tool manufacture and intensive core reduction stages, indicating again that both of these activities were conducted at this site.

Classification of the debitage into size classes also reveals generally similar patterns in the reduction of basalt and chert (Table 7-8). With both lithic materials, the most frequent size class is 10-20 mm, with basalt flakes in this class accounting for 39.8% and chert flakes in the class making up 38.6%. Likewise, the next two size classes combined represent similar proportions, with the basalt debitage in the 20-30 mm and 30-40 mm together comprising 34.6%, and the chert debitage in these same classes representing 32.6%. The principal differences between the basalt and chert debitage are observed at the extremes of the size scale. There is a tendency toward a higher proportion of chert flakes, as 25.2% of the chert debitage is less than 10 mm in length, while only 16.5% of the basalt debitage is this small. Conversely, 9.1% of the basalt flakes measure between 5-10 mm, while only 3.6% of the chert flakes are in this size range.

In summary, classification of the lithic debitage into flake classes, presence/absence of cortex, and size classes indicates a highly consistent pattern in the way in which basalt and chert were used at Yaquina Head. Core reduction involving the breaking up of cobbles was clearly an important activity, as reflected by the frequency of complete flakes, the proportion of flakes with cortex, and the occurrence of relatively large flakes at the site. At the same time, further reduction of these lithic materials into tools is indicated by the high proportions of flake fragments and debitage lacking cortex, and by the relatively high percentages of flakes (especially chert) in the smallest size classes.

In considering the relationship of the debitage to the stone tools recovered from the site, it is apparent that most of the flintknapping was carried out by means of direct free-hand percussion and was directed toward the manufacture of relatively simple, expedient tools. The manufacture of bifacial tools by means of pressure flaking was carried out, with a preference shown for chert over basalt for this purpose, but production of more carefully made tools such as projectile points and knives was clearly secondary in importance to the more basic stages of the lithic reduction sequence.

Table 7-8. Tabulation of lithic debitage by raw material and size classes.

Flake Size	Stratum 1	Stratum 2	Stratum 3	Auger Holes	Column Samples	Total	%
Obsidian							
to 5 mm		1				1	5.9%
5-10	12	2				14	82.3%
10-20	2					2	11.8%
Chert							
to 5 mm	32	4				36	2.3%
5-10	301	44	6	6	2	359	22.9%
10-20	434	129	23	15	5	606	38.6%
20-30	202	133	12	10	3	360	22.9%
30-40	87	58	2	5	1	153	9.7%
40-50	15	22	1	1		39	2.5%
50-60	5	6				11	0.7%
60-70		3				3	0.2%
70-80		1				1	0.1%
90-100	1					1	0.1%
Basalt							
to 5 mm	6			1		7	0.4%
5-10	239	37	2			278	16.1%
10-20	523	155	5	1	1	685	39.8%
20-30	238	122	5	15		380	22.1%
30-40	124	80	4	7		215	12.5%
40-50	38	28		5		71	4.1%
50-60	27	9	2			38	2.2%
60-70	11	7		1		19	1.1%
70-80	11	7		1		19	1.1%
80-90	7				1	8	0.5%
90-100	2					2	0.1%
Other							
5-10 mm		1				1	11.1%
10-20		3				3	33.3%
20-30		1				1	11.1%
30-40	4					4	44.5%

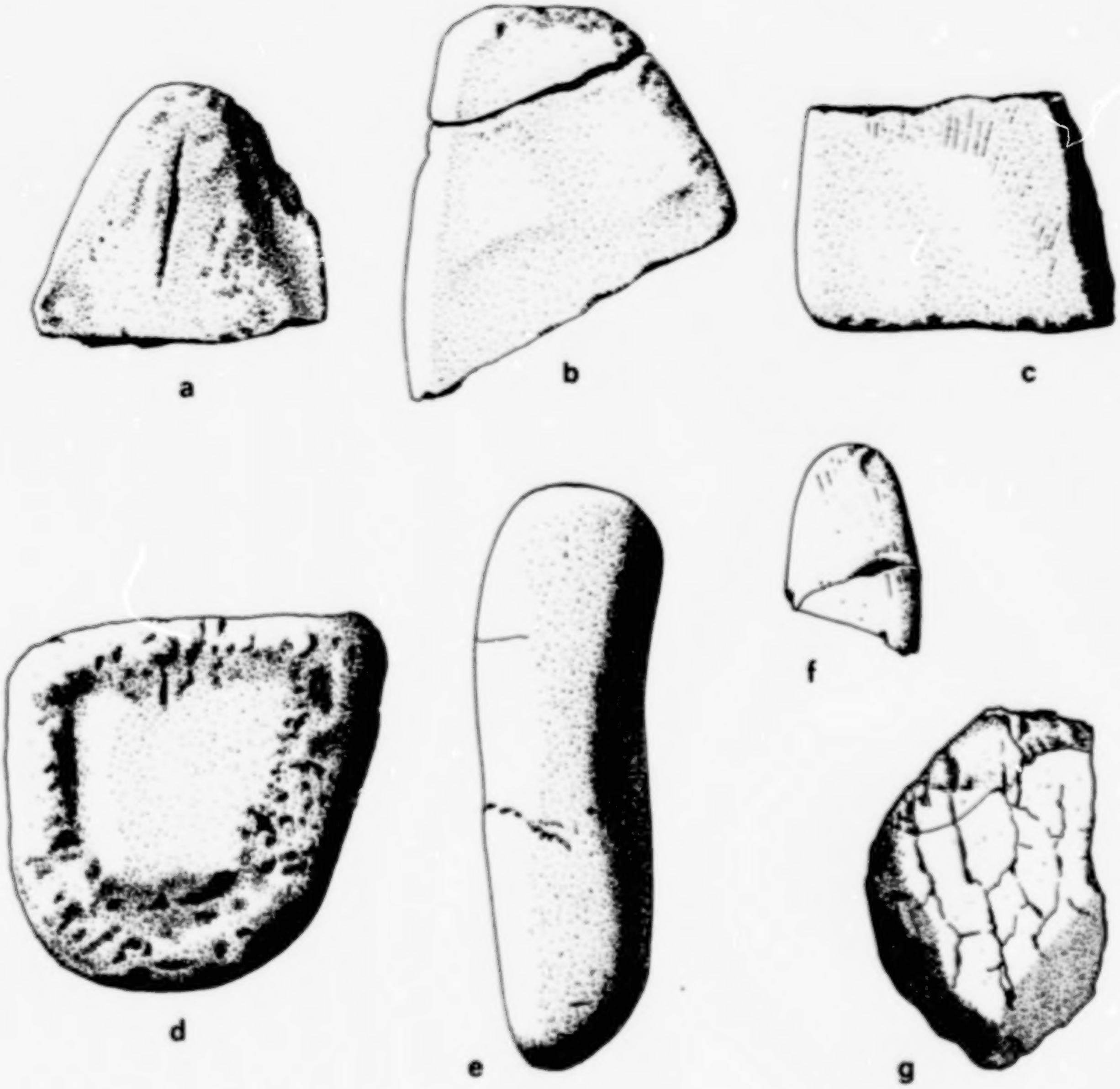


Figure 7-4. Abraders from Yaquina Head: a-d, sandstone; e-f, siltstone; g, mudstone (shown 65% actual size).

a. G-8/2-3
b. G-8/1-3
c. B-6/2-2
d. I-9/1-1
e. G-11/2-1
f. M-10/2-1
g. I-12/2-3

ABRADER SERIES

Forty-seven implements exhibiting signs of abrasive wear and presumed to have been used in the manufacture or maintenance of bone, antler, or shell tools were recovered. Twenty-one were found in Stratum 1, and the remaining 26 in Stratum 2. Forty-two of these abraders are pieces of sandstone, most of which have been pecked and abraded into flattened rectangular shapes (Figure 7-4a-d). Other raw materials used for abraders were siltstone, represented by one cobble (Figure 7-4e) and three pebbles (Figure 7-4f), and a single cobble fragment of mudstone (Figure 7-4g) which exhibits facets from abrasion.

BONE/ANTLER SERIES

A total of 25 bone and antler artifacts was recovered from Yaquina Head. Of these, only two items, a split bone awl and an antler beam wedge, were found in Stratum 1. The remaining 23 bone and antler tools were found in Stratum 2. Where identifiable, these bone and antler artifacts appear to have been made from the bones of large terrestrial mammals such as deer and elk.

Split Bone Awls

Eight bone splinters feature tips which have been sharpened for use as awls (Figure 7-5a-c). One was found in Stratum 1, and the remaining seven in Stratum 2.

Bone Needles

One complete bone needle (F-9/2-1) and another tip fragment (A-7/2-1) were recovered. The complete specimen, which features a hole for the thread, is 12.8 cm long (Figure 7-5e). The second specimen includes only a tip fragment, but it is placed in this artifact class because of its close similarity in shape and thickness to the complete needle recovered.

Bone Wedges

Two pieces of bone from a large mammal exhibit bits ground to a working edge indicating use as wedges. Both specimens have been split longitudinally, apparently as a result of heavy use. The more complete of the two specimens (D-9/2A-1) has a length of 13 cm and shows evidence of battering on the opposite end (Figure 7-5f). The bit width as measured across a point 1 cm back from the tip (following Mitchell

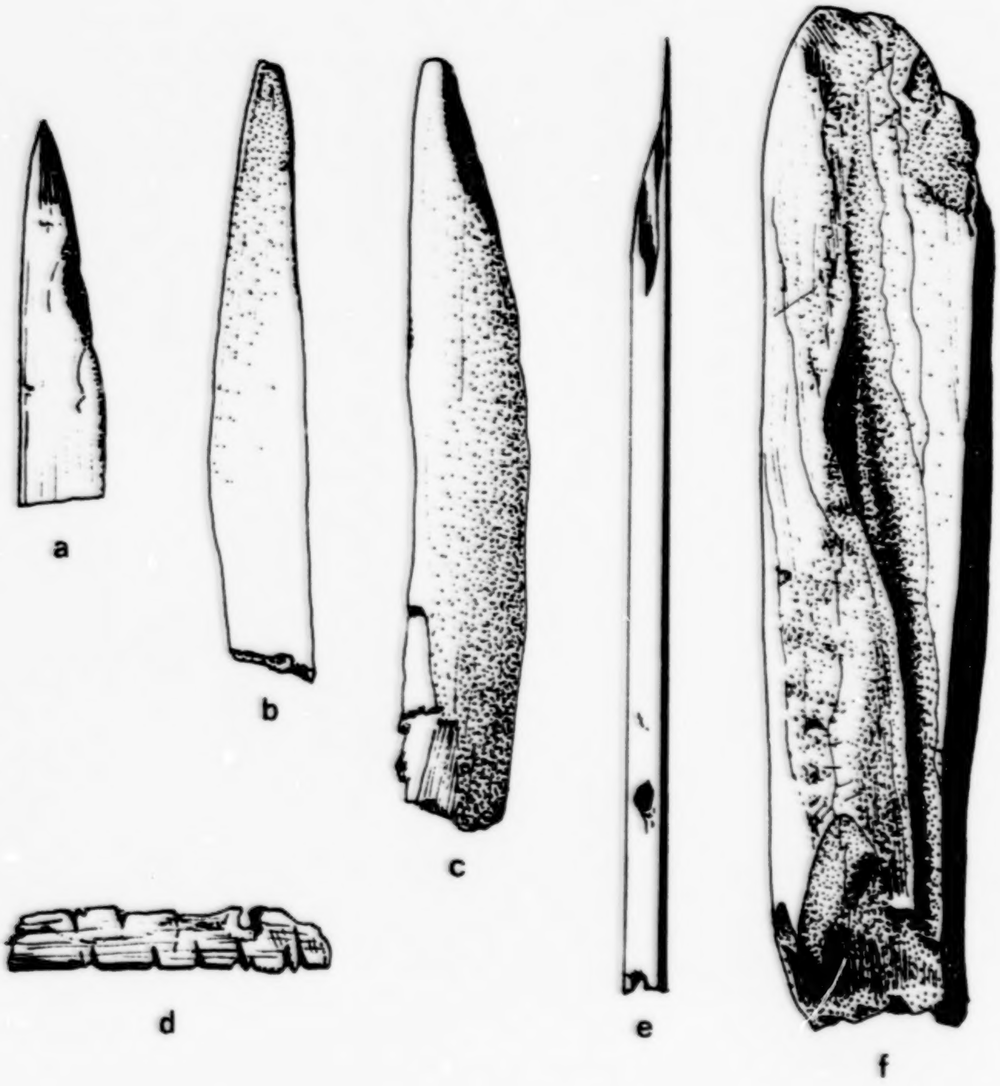


Figure 7-5. Bone artifacts from Yaquina Head: a-c, split bone awls; d, decorated bone; e, bone needle; f, bone wedge (shown actual size).

a. G-11/2-2
b. N-10/2-1
c. M-10/2-2
d. N-12/2B-1
e. F-9/2-1
f. D-9/2A-1

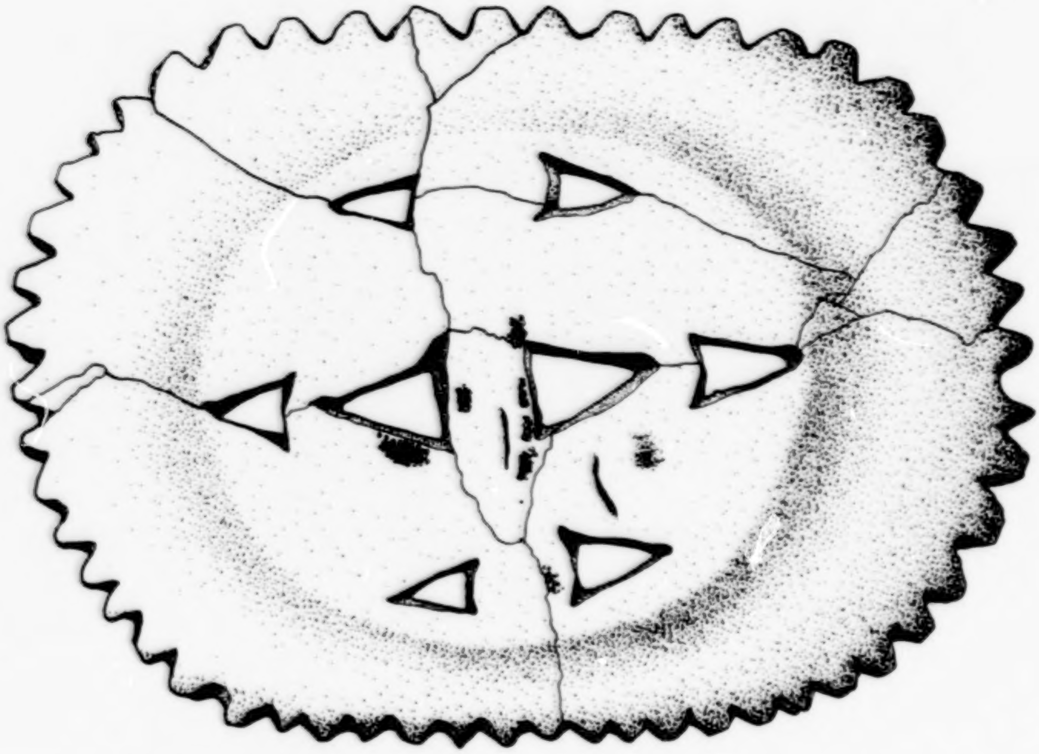


Figure 7-6. Carved whale bone artifact recovered in association with Feature 5 (shown approximately 40% actual size).

1971:212) is about 25 mm. On the smaller and more fragmentary specimen a portion of the bit width is missing, but it was at least 20 mm wide.

Carved Whale Bone

This unusual carved whale bone artifact (Figure 7-6) was part of Feature 5, found at a depth of 110 cm in Unit C. Burial 1, the skeletal remains of an infant, was situated below this artifact. This artifact, made from the epiphysis of a vertebral centrum of a whale, features a scalloped edge and eight triangles cut into its flat surface. This piece measured 32 cm in length and 23 cm in width. It had a maximum thickness of 1.5 cm, and a minimum thickness (in the area of a depression ring on the reverse side) of 1.1 cm.

The obverse face of the artifact, the side oriented toward the surface, appeared to be the internal structure of the bone as indicated by the frothy cellular texture. This worked face was noticeably more flat and smooth than the reverse side. It was also much darker than the reverse side, possibly from greater exposure to heat sources and charcoal.

On the reverse side, circumscribing the area of triangular designs there is a circular depression that appears to have been a natural surface of the bone. This face also appears somewhat "cupped" in that the edges flare slightly upward and out from the center.

The edge has been tapered on both sides into a lenticular form. There are 53 scalloped points around the circumference of the object, all of which were carefully carved into the edge. The points are of variable size and shape, with a basic triangular parameter; some points come to a distinct apex while others have flattened tips.

The eight triangles are symmetrically arranged and appear to have been cut from both sides of the object. This is indicated by slightly sloping edges which meet on the interior of the cut. No wear patterns are apparent on any of the cut surfaces or corners.

This artifact was recovered in its entirety, but it had fractured into eleven pieces. With the agreement of the Sacred Lands Committee of the Confederated Tribes of Siletz Indians, one of these pieces, weighing 45 g, was submitted for radiocarbon dating, yielding a date of 3400 ± 240 BP (Beta-17941). The remaining pieces of the carved whale bone artifact were given to the Sacred Lands Committee and reinterred with the infant's skeletal remains on the Siletz Reservation.

Decorated Bone

A single bone fragment (N-12/2B-1) decorated by incisions was recovered from Stratum 2. This piece also features a hole drilled near one end (Figure 7-5d). The original shape and function of this specimen cannot be determined, but its size and the presence of a hole suggests that this piece may have been a pendant.

Worked Bone

Five pieces of worked bone cannot be classified as to function or original form. In all cases the working consisted of abrasion which apparently occurred while shaping the object.

Antler Net Shuttle

An extensively modified piece of antler appears to have functioned as a net shuttle (B-8/2-2). This specimen exhibits evidence of abrasive wear at the tip, and a hole for netting near the base (Figure 7-7a). This artifact measures 14.7 cm in length, while the netting hole measures about 4 mm in diameter.

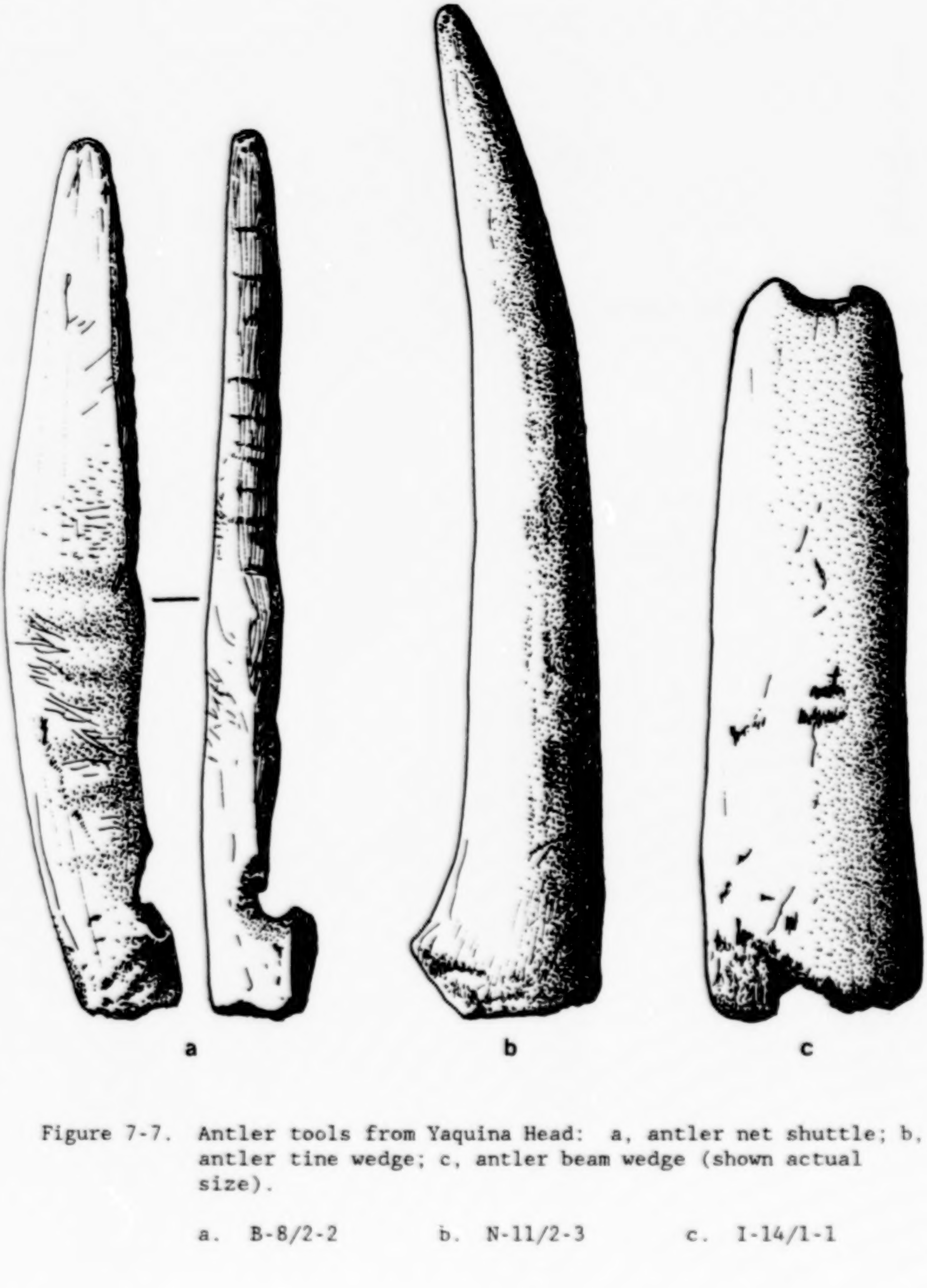


Figure 7-7. Antler tools from Yaquina Head: a, antler net shuttle; b, antler tine wedge; c, antler beam wedge (shown actual size).

a. B-8/2-2 b. N-11/2-3 c. I-14/1-1

Antler Tine Wedges

One complete antler tine (N-11/2-3) and another tine tip fragment (M-12/2B-2) exhibit modification near their tips indicating use as wedges (Figure 7-7b). The complete specimen is 17.3 cm long and has a bit width of 9 mm. The bit width on the fragmentary specimen is 10 mm.

Antler Beam Wedges

One whole antler and two tip fragments exhibiting bits ground to a working edge are classified as beam wedges (cf. Mitchell 1971:141-142). The poll end of the whole specimen (I-14/1-1) is the natural corona of the antler and shows evidence of battering (Figure 7-7c). The whole specimen is 12.3 cm long, and has a bit width of 27 mm. The two fragmentary specimens both have bit widths of approximately 20 mm.

SHELL ARTIFACTS

Two shell items recovered from Stratum 2 may represent beads. The first item (F-9/2-4) is a piece of unidentified shell about 5 mm in diameter. Although small and undistinguished, this item has rounded edges and a hole through it, suggesting that it may have been modified for stringing on a necklace.

The second item (M-9/2-2) is an unmodified Olivella biplicata shell. This was the only example of this species recovered. Olivella shells were commonly used as beads by natives peoples. Although the spire was often ground to facilitate stringing on a necklace, they could also be strung without modification. The rarity of this species at Yaquina Head suggests that it may have been a bead.

CHAPTER 8

SHELL MIDDENS ON THE NORTH SIDE OF YAQUINA HEAD

by Rick Minor and Ruth L. Greenspan

Archaeological testing in 1980 by Oregon State University documented the presence of two sizable shell middens situated at the mouth of a small unnamed creek approximately 0.6 km northeast of the site investigated during this project (35LNC62) on the tip of Yaquina Head. At this location, a layer of marine shells containing animal bones and occasional artifacts has been exposed by erosion in the face of a steep cliff above the ocean. The shell layer exposed in the cliff face is related to the larger of the two sites (35LNC49), while the smaller shell midden (35LNC50) is located a short distance to the east (Figure 8-1). The two sites occur within a meadow to the east of Yaquina Head. Both shell middens are situated on the south bank of a gully formed by erosion of the spring-fed stream, which filters into the underlying sandstone bedrock near the edge of the cliff above the ocean.

Oregon State University's testing program was conducted in response to plans for development of the meadow and, accordingly, this fieldwork was carried out entirely on private land. One of these shell middens (35LNC50) extends onto BLM property, and it was originally planned that test excavations would be undertaken at this site during the 1986 field season. Because the Yaquina Head investigations were more complicated than expected, however, the testing plan was not implemented. The following descriptions of these two shell middens are based on the original project report (Snyder and Ross 1980), supplemented with the results of artifact and faunal analysis by the present authors of the collections recovered by Oregon State University.

35LNC49

This shell midden, referred to as Site B in the project report (Snyder and Ross 1980), had been heavily disturbed by bulldozing, and in places the shell layer had been removed down to the underlying sterile soil. The disturbed sediments were apparently used to create an earthen dam across the gully. Overall, the midden was estimated to have once covered an area extending south from the gully for approximately 36 m. The east-west dimensions of the site were less certain, due to the disturbance from bulldozing, but the midden appears to have

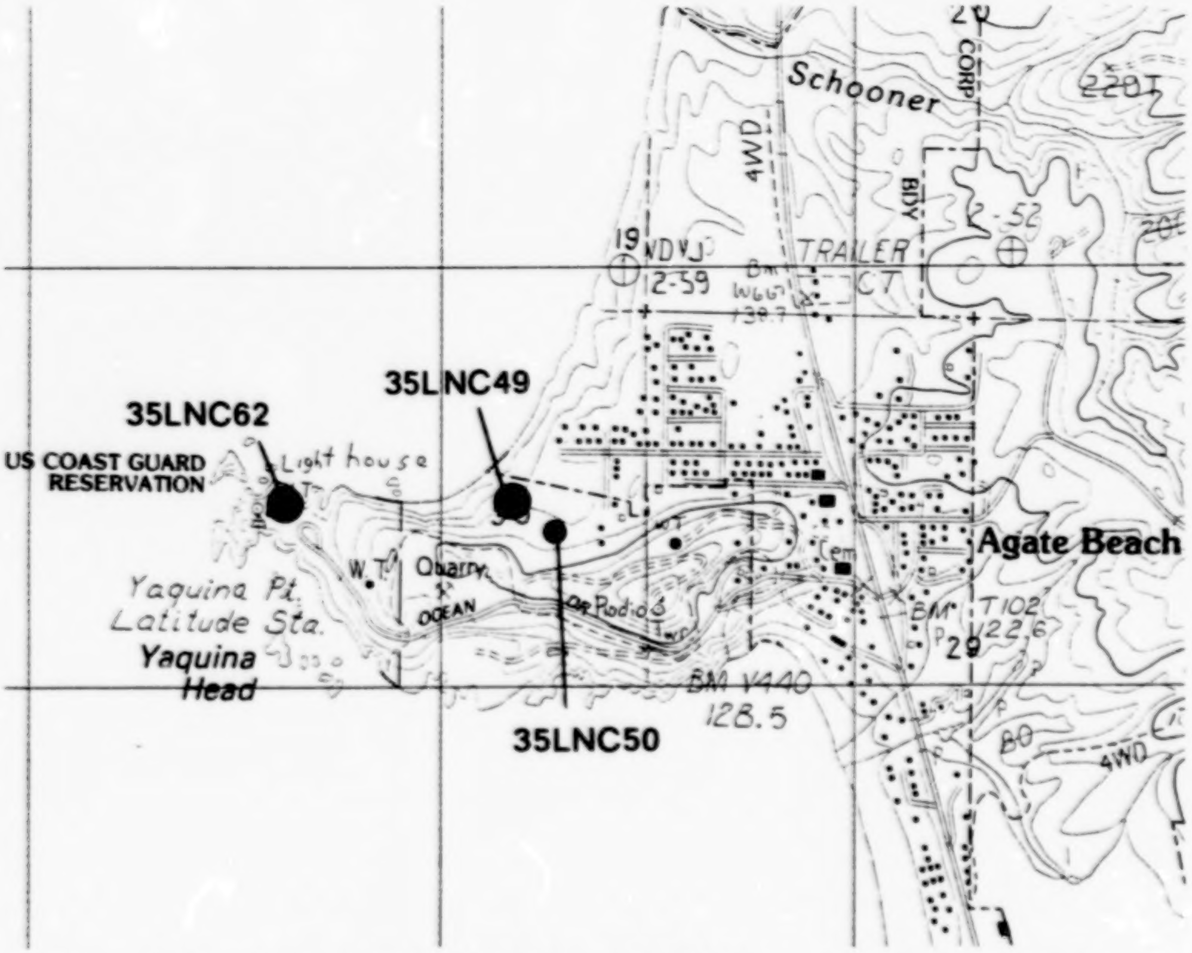


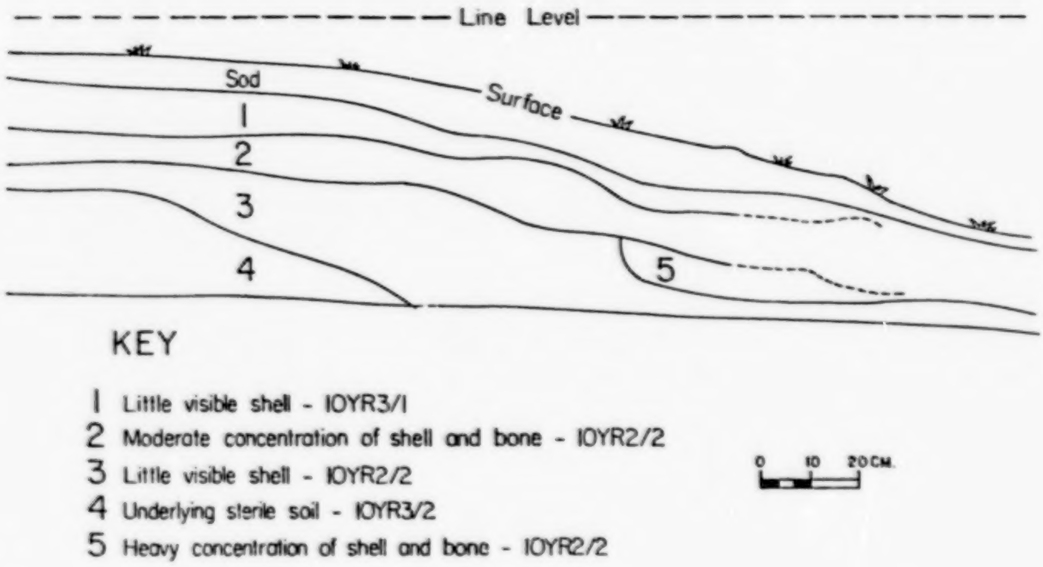
Figure 8-1. Location of 35LNC49 and 35LNC50 on the north side of Yaquina Head.

extended for at least 30 m (Snyder and Ross 1980:13). Cultural materials were recovered from three 1 x 2 m test pits and two short test trenches in this area.

The reported stratigraphy varied somewhat between the three test pits, with three to four strata represented (Figure 8-2). Stratum 1 was the sod layer. The cultural deposit was represented by Strata 2 and 3. In Test Pit B, the midden concentration occurred in Stratum 2, with little shell visible in Stratum 3 (Snyder and Ross 1980:29). In contrast, in Test Pit E little shell was visible in Stratum 2, and the midden concentration occurred in Stratum 3 (Snyder and Ross 1980:31). Overall, judging from the profiles of the walls of the test pits, the cultural deposits at 45LNC49 appear to have been between 20-35 cm thick. Stratum 4 was the underlying sterile soil (Snyder and Ross 1980:17).

Marine shells observed at this site include sea mussels and

TEST PIT B - WEST WALL SOIL PROFILE


Line Level
Sod
Surface
1
2
3
4
5
KEY
1 Little visible shell - 10YR3/1
2 Moderate concentration of shell and bone - 10YR2/2
3 Little visible shell - 10YR2/2
4 Underlying sterile soil - 10YR3/2
5 Heavy concentration of shell and bone - 10YR2/2
0 10 20CM.

TEST PIT E - WEST WALL SOIL PROFILE

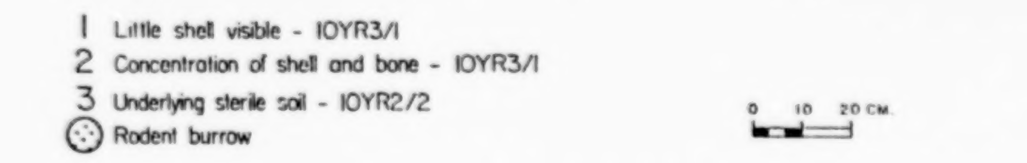

Line Level
Sod
Surface
1
2
3
KEY
1 Little shell visible - 10YR3/1
2 Concentration of shell and bone - 10YR3/1
3 Underlying sterile soil - 10YR2/2
Rodent burrow
0 10 20 CM.

Figure 8-2. Stratigraphic profiles from 35LNC49 (from Synder and Ross 1980:29,31).

Table 8-1. Inventory of faunal remains recovered from 35LNC49.

				Level					
Taxon	Common Name	Trench	Surf.	2	3	4	5	6	Total
TERRESTRIAL MAMMALS:									
Odocoileus hemionus	Mule deer	9							9
Cervus elaphus	Elk	1		1		5			7
Cervidae	Elk and deer					3			3
Carnivora	Carnivore	1							1
MARINE MAMMALS									
Phoca vitulina	Harbor seal	3		6	4				13
Eumetopias jubatus	Steller sea lion					1			1
Pinnipedia	True and eared seals		3		7				10
Delphinidae	Dolphins				2				2
Enhydra lutris	Sea otter		1	1					2
UNIDENTIFIED MAMMALS		52	1	52	13	59	3		180
UNIDENTIFIED BIRDS:					3				3
FISH:									
Salmonidae	Salmon and trout				4	4			8
Merluccius productus	Pacific hake	1		1		9		1	12
Embiotocidae	Surfperches	1							1
Ophiodon elongatus	Lingcod	1							1
Unidentifiable fish		2				2			4
UNIDENTIFIABLE BONE FRAGMENTS		19		12		4			35
TOTAL		90	5	73	33	87	3	1	292

barnacles, with clams also represented. Recovered animal bones include specimens of terrestrial and marine mammals, birds, and fish. Marine mammals include adult male Steller sea lion, adult harbor seal, adult dolphin, and adult sea otter. Elk and deer dominate the terrestrial mammal assemblage. Much of the material classified as unidentified mammal likely represents elk and deer.

The fish remains recovered from 35LNC49 include Pacific hake, salmon, surfperch, and lingcod. A few unidentified bird remains were recovered as well. The distribution of animal bones by level is shown in Table 8-1.

The artifact assemblage from 35LNC49 consists of 90 items (Table 8-2). Chipped stone artifacts include a chert projectile point (TPC-3-1; Figure 8-3a) measuring 3.1 cm in length, 1.5 cm in width, 0.5 cm thick, and weighing 1.6 g. Other chipped stone artifacts include one

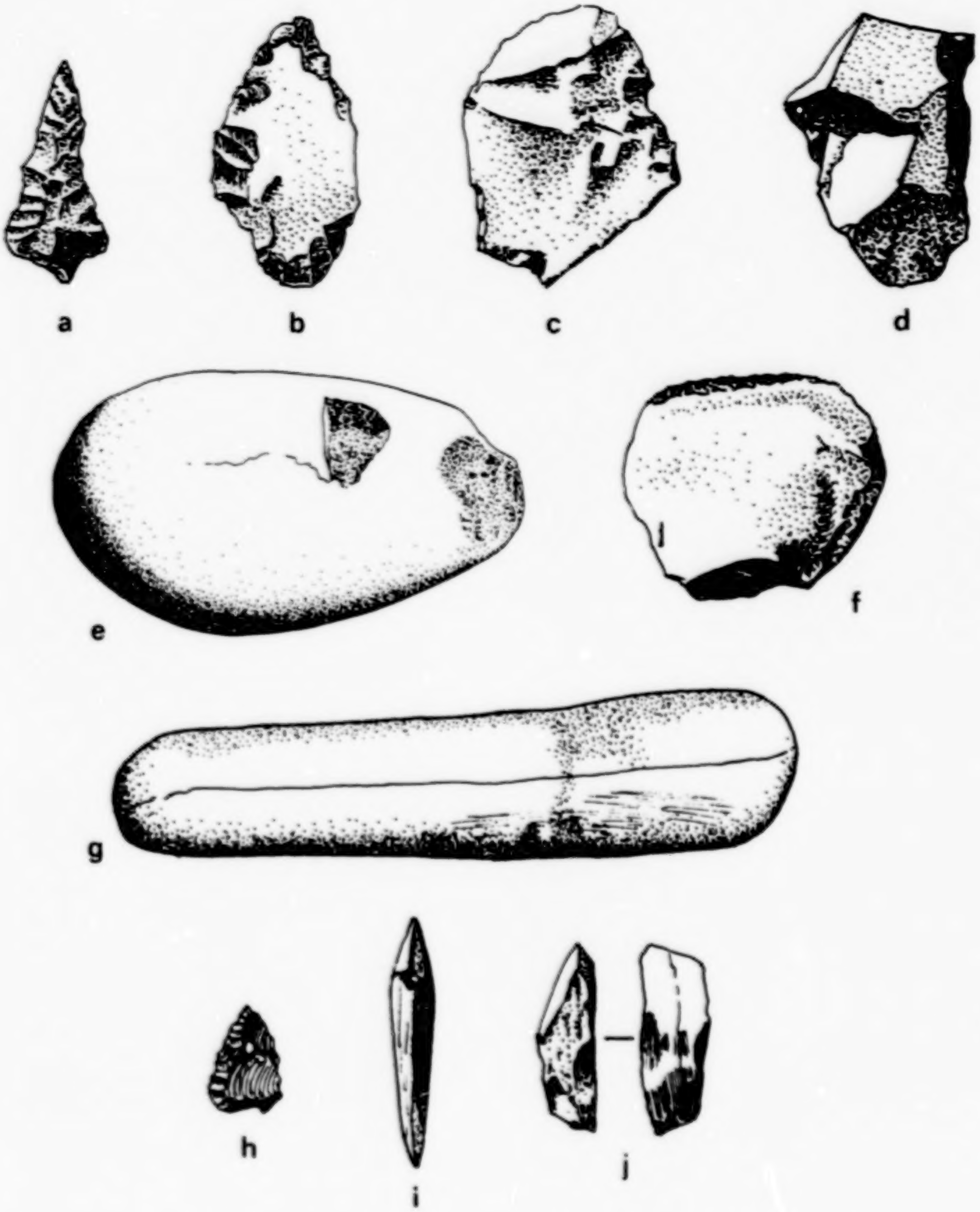


Figure 8-3. Artifacts from 35LNC49 (a-g) and 35LNC50 (h-j) (shown actual size except e. which is 65% actual size).

a. TPC-3-1
b. TPC-2-1
c. TR-1W-1
d. TPC-2-3
e. TPE-3-1
f. TPE-3-2
g. TPC-2-2
h. TPA-2-1
i. TPA-3-1
j. TPA-3-2

chert flake knife (TPC-2-1; Figure 8-3b), one used chert flake (TR-1W-1; Figure 8-3c) and a chert core (TPC-2-3; Figure 8-3d).

In addition, two broken chert cobbles (SF-1 and SF-2), a broken basalt cobble (TPC-3-2), 76 pieces of chert debitage, and four pieces of basalt debitage were recovered. Cobble or pebble tools found at 35LNC49 include a basalt hammer (TPE-3-1; Figure 8-3e), a used basalt pebble flake (TPE-3-2; Figure 8-3f), and a small elongated cobble exhibiting striations and partially covered with tar or asphaltum (TPC-2-2; Figure 8-3g).

35LNC50

This shell midden, referred to as Site A in the project report (Snyder and Ross 1980), extends from the gully formed by the spring-fed stream southward for 21 m, with an east-west dimension of 31 m. A single 1 x 2 m test pit excavated in this area encountered four distinct strata: Stratum 1, a thin sod layer; Strata 2 and 3, containing marine shell, animal bones, and fire cracked rocks; and Stratum 4, the underlying sterile soil.

Stratum 2, the upper layer of the cultural deposit, was distinguished from the lower cultural stratum by its greyish matrix and finely fractured marine shells. This stratum had a thickness of approximately 15 cm near the center of the shell midden (Snyder and Ross 1980:9). Stratum 3, the lower layer of the cultural deposit, was

Table 8-2. Inventory of artifacts from 35LNC49.

			Level Below Surface					
Artifact Class	Trench	Surface	2	3	4	5	6	Total
Projectile point				1				1
Flake knife			1					1
Used flakes	1							1
Core			1					1
Broken cobbles		2		1				3
Chert debitage	2	1	46	19	7		1	76
Basalt debitage			2	1	1			4
Hammer				1				1
Used pebble flake				1				1
Dauber			1					1
TOTAL	3	3	51	24	8	0	1	90

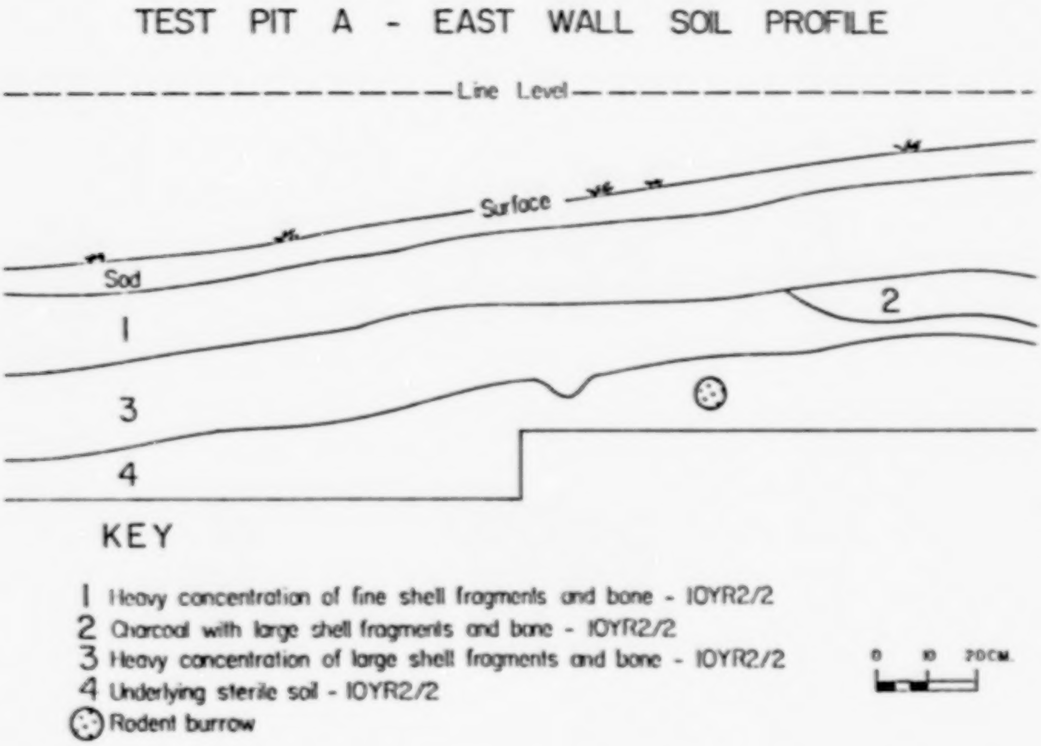

TEST PIT A - EAST WALL SOIL PROFILE
Line Level
Surface
Sod
1
2
3
4
KEY
1 Heavy concentration of fine shell fragments and bone - 10YR2/2
2 Charcoal with large shell fragments and bone - 10YR2/2
3 Heavy concentration of large shell fragments and bone - 10YR2/2
4 Underlying sterile soil - 10YR2/2
Rodent burrow
0
10
20CM.

Figure 8-4. Stratigraphic profile from 35LNC50 (from Snyder and Ross 1980:28).

densely packed with marine shells, animal bones, charcoal, and fire-cracked rock, and contained very little soil. Judging from the profile of the test pit wall, this stratum appears to have averaged about 12 cm in thickness (Figure 8-4; Snyder and Ross 1980:28).

Marine shellfish represented in these strata included sea mussels, barnacles, and clams (Snyder and Ross 1980:12). Analysis of the animal bones recovered from this site shows that the collection includes both adult and juvenile harbor seals. In addition, several bones representing sea lions were identified, including adult male and female Steller sea lions, several specimens that are probably adult female Steller sea lion, but may represent adult male California sea lion, and one specimen of adult female northern fur seal. Adult and juvenile sea otter remains were recovered, as well as a single fragment of whale bone.

Terrestrial mammals in the assemblage include elk, deer, and a single rodent specimen. A number of mammal bones too fragmentary for positive identification were recovered; the size and texture of these fragments suggests that many of them represent elk and/or deer. Some fish remains were recovered, including elements representing Pacific hake, surfperch, rockfish, greenling, and lingcod. Several fragments of unidentified bird remains are also included in the collection. The distribution of the faunal remains by level is shown in Table 8-3.

Artifacts recovered from 35LNC50 consisted of only 11 items (Table 8-4). Stone artifacts included a small obsidian used flake (TPA-3-2; Figure 8-3h), a chert used flake (TPA-5-1), six pieces of chert debitage, and one piece of basalt debitage. Two bone artifacts were also found. A wedge-based bone point (TPA-3-1; Figure 8-3i) has dimensions of 3.6 cm in length, 0.6 cm in width, and 0.6 cm in thickness. Bone points of this type are generally interpreted to have served as arming points for composite toggling harpoon heads. The other bone artifact recovered is the tip fragment from a bone wedge (TPA-2-1; Figure 8-3j).

Table 8-3. Inventory of faunal remains from 35LNC50.

			Level						
Taxon	Common Name	Sod	1	2	3	4	5	6	Total
TERRESTRIAL MAMMALS:									
Odocoileus hemionus	Mule deer				3	2			5
Cervus elaphus	Elk				3		1		4
Rodentia	Rodents				1				1
MARINE MAMMALS:									
Phoca vitulina	Harbor seal		2		5	2	1	52	62
Eumetopias jubatus	Steller sea lion						3	1	4
Callorhinus ursinus	Northern fur seal						1		1
Otariidae	Eared seals					4		12	16
Pinnipedia	True and eared seals				1	5		7	13
Cetacea	Whales			1					1
Enhydra lutris	Sea otter					10			10
UNIDENTIFIABLE MAMMALS		2	12	21	201	163	32	125	556
FISH:									
Merluccius productus	Pacific hake							2	2
Embiotocidae	Surfperches							2	2
Sebastes sp.	Rockfishes					2			2
Hexagrammos sp.	Greenlings							1	1
Ophiodon elongatus	Lingcod					1			1
Unidentified fish			1	2	4	10		6	23
UNIDENTIFIED BIRDS					2	17		24	43
UNIDENTIFIABLE BONE FRAGMENTS				35	189	227	2	236	689
TOTAL		2	15	59	409	443	40	468	1436

Table 8-4. Inventory of artifacts from 35LNC50.

		Level Below Surface					
Artifact Class	Sod	1	2	3	4	5	Totals
Obsidian used flake				1			1
Chert used flake						1	1
Chert debitage	1	1	3		1		6
Basalt debitage	1						1
Bone point				1			1
Bone wedge			1				1
TOTAL	2	1	4	2	1	1	11

DISCUSSION

Located near the confluence of a small creek with the ocean, inhabitants of these two shell middens were ideally situated for ready access to both freshwater and marine resources. In addition, the setting of these sites on the north side of Yaquina Head meant that they were sheltered somewhat from winter storms carried on southerly winds. Based on the limited testing carried out, the two sites appear to have similar internal structures, as at both localities the cultural deposit consisted of two strata bracketed by the sod and the underlying sterile soil. Sea mussels and barnacles were reported to have been the most common marine shells comprising the middens, with clams also represented at both sites.

The two shell middens differ, however, in terms of the amount of chipped stone debitage recovered, as 80 specimens were found at 35LNC49 but only seven at 35LNC50. Comparison of the debitage from these two sites is difficult because of the small sample available from 35LNC50. Instead, a more accurate characterization of the debitage can probably be obtained by combining the collections together. Classification of the debitage according to the classes proposed by Sullivan and Rozen (1985) indicates that more than half of the chert debitage consists of complete flakes (63.4%), followed in declining order of frequency by debris (18.3%), fragments (14.6%), and broken flakes (3.7%) (Table 8-5).

Examination of the debitage in terms of presence/absence of cortex indicates that 27% of the chert debitage and 80% of the basalt debitage exhibits cortex (Table 8-6). Classification of the debitage by size indicates that almost 80% of the chert flakes cluster in the 1-3 cm

Table 8-5. Summary of debitage classes at 35LNC49 and 35LNC50.

Flake Type		35LNC49	35LNC50	Totals	%
Chert:	Complete	48	4	52	63.4%
	Broken	3		3	3.7%
	Fragment	11	1	12	14.6%
	Debris	14	1	15	18.3%
	TOTALS	76	6	82	
Basalt:	Complete	1	1	2	40%
	Debris	3		3	60%
	TOTALS	4	1	5	

size classes, although a considerable size range is represented (Table 8-7). The high proportions of complete flakes and debris, the ratio of cortex to non-cortex flakes, and the range of size classes represented indicate that both core reduction and shaped stone tool manufacture occurred at these sites (Sullivan and Rozen 1985:773).

Analysis of the animal bones recovered indicates some significant differences in the animals hunted by the inhabitants of these two sites. Although testing at 35LNC49 included excavation of three 1 x 2 m test pits and two short trenches, as compared with excavation of only one 1 x 2 m test pit at 35LNC50, a significantly larger sample of animal bones was recovered from 35LNC50. This is in contrast to the

Table 8-6. Presence/absence of cortex on lithic debitage from 35LNC49 and 35LNC50.

	35LNC49		35LNC50		Totals	
Material	Cortex	Non-Cortex	Cortex	Non-Cortex	Cortex	Non-Cortex
Chert	22 29%	54 71%	--	6 100%	22 27%	60 73%
Basalt	3 75%	1 25%	1 100%	--	4 80%	1 20%

Table 8-7. Tabulation of debitage by raw material and size.

	35LNC49		35LNC50		Totals			
Flake Size (mm)	Chert	Basalt	Chert	Basalt	Chert	%	Basalt	%
0-5	1				1	1.2%		
5-10	29				29	35.3%		
10-20	17	1			17	20.7%	1	20%
20-30	18		1		19	23.2%		
30-40	5		2		7	8.6%		
40-50	4	1	3	1	7	8.6%	2	40%
50-60		1					1	20%
60-70	2	1			2	2.4%	1	20%
TOTAL	76	4	6	1	82		5	

sample of artifacts recovered, as 35LNC49 has a larger and more varied artifact assemblage than 35LNC50.

This situation cannot be explained in terms of differential preservation at the two sites, with the larger sample being a function of more highly fragmented bone. The amount of bone classified as unidentifiable may be seen as a general indicator of the degree of fragmentation in the faunal assemblage. Even with all the identifiable categories eliminated from the analysis, however, the assemblage from 35LNC50 still contains nearly twice as many faunal specimens as the assemblage from 35LNC49.

Although basically the same species are represented at the two shell middens, the relative proportions of various taxa differ. Table 8-8 shows a rank ordering of the various faunal categories at the two sites. The apparent differences between the two sites were tested by statistically comparing the relative abundances of marine mammals, terrestrial mammals, unidentified mammals, fish, and birds.

The most strongly represented category at both sites is unidentifiable mammals. At 35LNC49 fish, terrestrial mammals, and marine mammals are represented in roughly equal proportions, and birds are a very minor constituent of the assemblage. At 35LNC50, marine mammals are relatively strongly represented, birds and fish are less important, and terrestrial mammals make up a very small proportion of the assemblage. A Chi square contingency table indicates that the faunal assemblages from the two sites are different from one another at the .01 level of significance (Table 8-9).

Several species represented in the faunal assemblages can be used to infer the seasonality of the occupations at these two shell middens. The presence of adult male Steller sea lion and juvenile seals and sea lions from 35LNC50 suggests summer or early fall occupation of that site. Presently, adult male _Eumetopias jubatus_ are present at the rookeries only during the breeding season from June through mid-July, after which they begin migrating northward. After the end of October adult males of this species are not found along the Oregon coast (Mate 1973).

Precise age estimates for the juvenile harbor seal specimens recovered were not possible because of the lack of comparative material with good age data, but many of them appeared to be in the two to six month range. Most harbor seal births in Oregon occur in April and May, but there is some variation, and births may range from mid-February to mid-June (Mate 1984:440).

Most sea otter births occur in the summer, but mating (and hence births) may occur throughout the year. Thus the presence of fairly

Table 8-8. Summary of vertebrate fauna at 35LNC49 and 35LNC50.

	35LNC49	35LNC50
RANK 1	UNIDENT. MAMMALS 173 73.3%	UNIDENT. MAMMALS 533 73.6%
RANK 2	FISH 22 9.3%	MARINE MAMMALS 107 14.8%
RANK 3	TERRESTRIAL MAMMALS 20 7.4%	BIRDS 43 5.9%
RANK 4	MARINE MAMMALS 18 7.6%	FISH 31 4.3%
RANK 5	BIRDS 3 1.3%	TERRESTRIAL MAMMALS 10 1.4%

Table 8-9. Chi square test, NISP per faunal category at 35LNC49 and 35LNC50.

Site	Terrestr. Mammals	Marine Mammals	Unident. Mammals	Fish	Birds	Total
35LNC49	20 (7.38)*	18 (30.73)	173 (173.56)	22 (13.03)	3 (11.31)	236
35LNC50	10 (22.63)	107 (94.27)	533 (532.44)	31 (39.97	43 (34.69)	724
Total	30	125	706	53	46	960

* expected frequencies in parentheses Chi square = 51.9

young Enhydra lutris remains from 35LNC50 does not provide any definitive indication of seasonality, although it further suggests late summer or early fall occupation.

The absence of juvenile marine mammals from 35LNC49 may suggest a different season of occupation than that of 35LNC50. However, the presence of one specimen representing adult male Steller sea lion at 35LNC49 is again indicative of summer or early fall occupation.

In view of their general similarity in terms of structure and content, it seems likely that both sites were occupied during roughly the same interval in late prehistoric times. A single date of 1150 ± 50 radiocarbon years BP (DIC-1758) has been reported from 35LNC50 (Ross 1983:214). No radiocarbon dates are available from 35LNC49, but the single projectile point recovered from this site could easily date within the span of occupation indicated at 35LNC50. Use of these two sites by native peoples may have continued into the early historic period, as the south fork of the "Indian Coast Trail" shown on an 1886 U.S. Coast Guard map of the Yaquina Head area (Chart No. 775, OHS file) leads to the drainage along which these sites are located (Dicken 1978; Figure 8-5). The trail terminates very close to 35LNC50.

COMPARISON WITH 35LNC62

Sites 35LNC49 and 35LNC50 are situated 0.6 km northeast of 35LNC62, in a more protected setting in the lee of the headland. Judging from the limited testing carried out at these sites, they appear to be less areally extensive than 35LNC62. Based on a single radiocarbon date of 1150 ± 50 years BP from 35LNC50, these sites

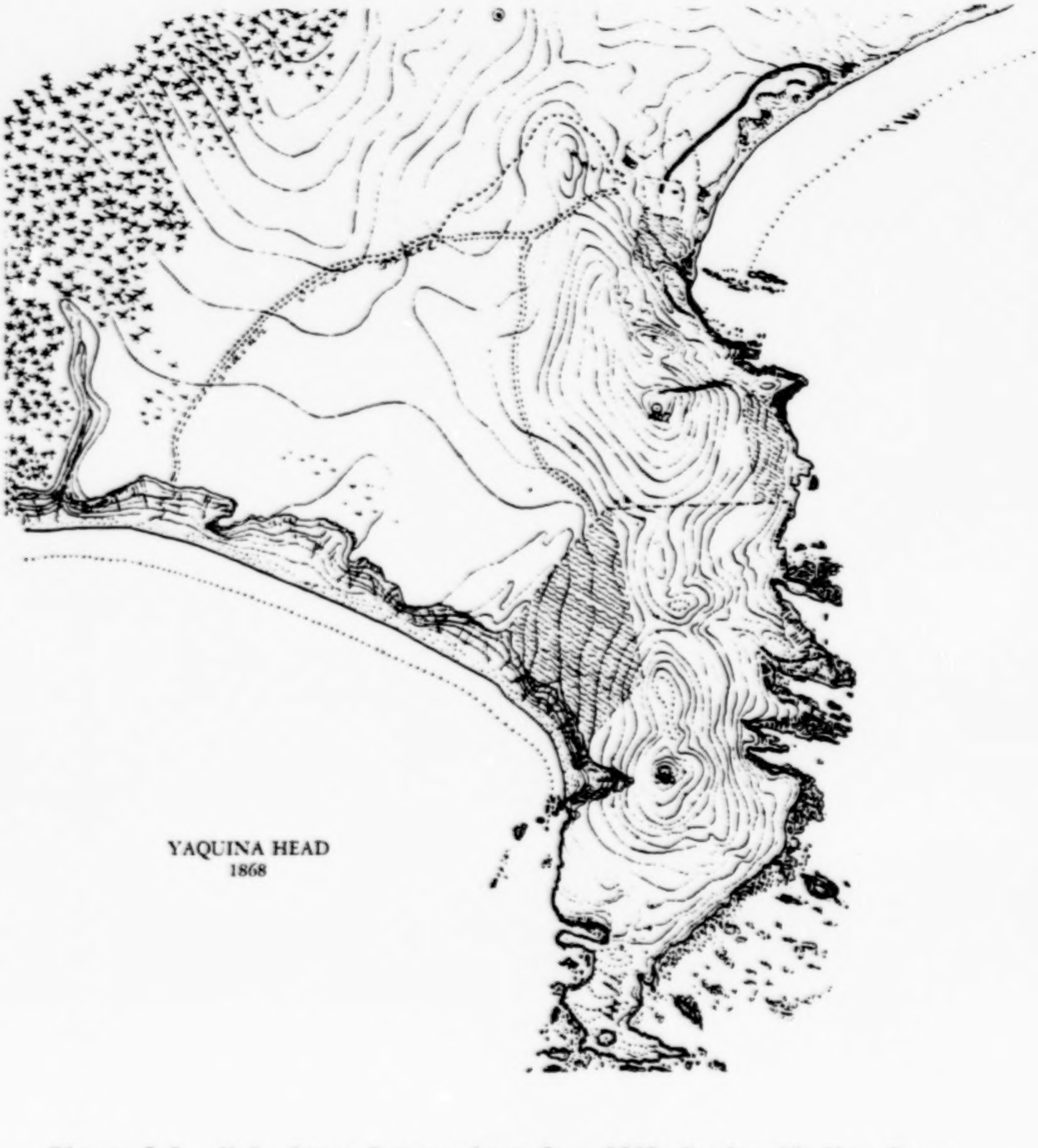


Figure 8-5. U.S. Coast Survey chart from 1868 showing "Indian Coast Trail" near Yaquina Head (from Dicken 1978).

postdate 35LNC62, which dates from approximately 5000 to 2000 years ago.

Because the small-scale testing at 35LNC49 and 35LNC50 resulted in correspondingly low sample sizes, it is difficult to compare these sites with 35LNC62. In addition, different recovery methods were used during the two projects, as the cultural deposit at 35LNC49 and 35LNC50 was passed through 1/4-inch mesh, while the smaller 1/8-inch mesh was employed at 35LNC62. Previous research has demonstrated that the use of 1/4-inch mesh results in the loss of significant amounts of lithic debitage as well as fish, bird, and small mammal bone (cf. Thomas 1969; Aikens and Greenspan 1986). Consequently, use of the larger 1/4-inch mesh is not adequate for recovery of cultural materials in coastal sites.

The excavations at 35LNC49 and 35LNC50 produced a narrower range of artifacts, but this situation is probably due in large part to the smaller scale of the fieldwork. The same artifact classes, with the exception of the dauber from 35LNC49, are also represented at 35LNC62. The only temporally-diagnostic artifact recovered was the projectile point from 35LNC49. This point has a fragmentary base, but it appears to be representative of a narrow-necked style characteristic of the late prehistoric period. In contrast, the projectile points from 35LNC62 include a lozenge-shaped obsidian specimen and a broad-necked chert specimen, both of which are characteristic of earlier occupations. The limited chronological information provided by these projectile points is thus consistent with the radiocarbon dates which indicate that 35LNC62 was occupied before 35LNC49 and 35LNC50.

The only other worthwhile artifact assemblage comparisons relate to the lithic debitage recovered from the various sites. It is noteworthy that little basalt debitage was recovered from 35LNC49 and 35LNC50. The relative scarcity of basalt debitage in these sites is probably due to the fact that basalt cobbles are not present on the beach below 35LNC49 and 35LNC50, as they are at 35LNC62.

Use of chert at 35LNC49 and 35LNC50 varied slightly in comparison with the patterns observed at 35LNC62. The chert debitage at 35LNC62 was dominated by flake fragments (48%) and complete flakes (39%), while the chert debitage at 35LNC49 and 35LNC50 was dominated solely by complete flakes (63%). The proportions of cortex and non-cortex chert flakes are generally similar, 23% cortex and 77% non-cortex at 35LNC62 versus 27% cortex and 73% non-cortex at 35LNC49 and 35LNC50. Flake size cannot be reliably compared, due to the use of different recovery methods, but it appears that the same size classes are represented in the chert debitage at all sites.

It is not immediately clear whether the variations noted in the debitage are related solely to differences in the availability of raw materials, or if differences in the flintknapping activities carried

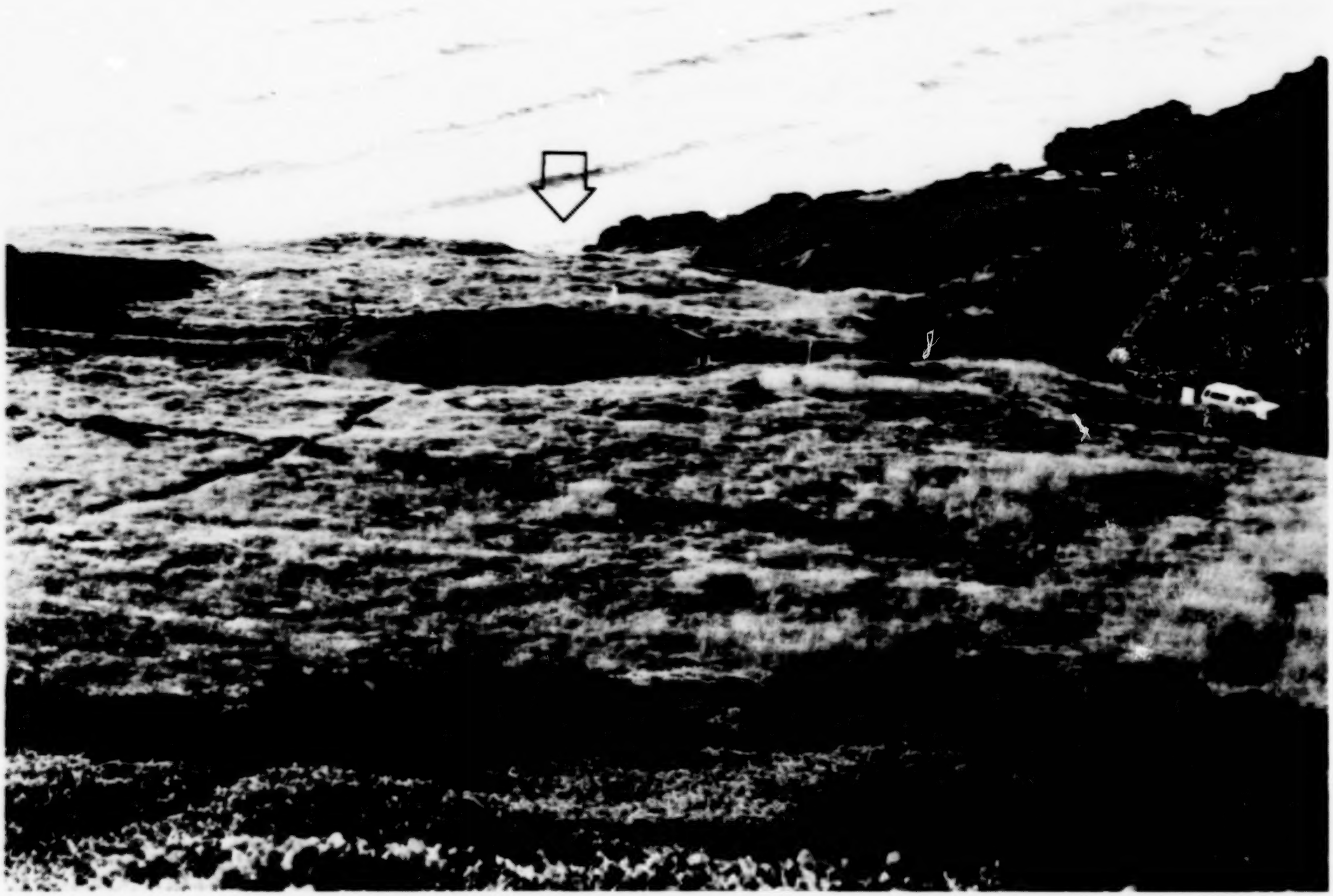


Figure 8-6. View to the northwest showing the setting of 35LNC49 (below arrow) and 35LNC50 (right foreground) to the north of Yaquina Head in real estate development.

out at the various sites are actually reflected. Clearly the same general activities--core reduction of beach cobbles and shaped stone tool manufacture of casual cobble and flake tools--are represented at all sites.

The faunal assemblages from 35LNC49 and 35LNC50 show some significant differences from 35LNC62. Sites 35LNC49 and 35LNC50 together have a considerably smaller and more restricted assemblage than 35LNC62. The 35LNC62 assemblage includes 17 taxa that are not represented at 35LNC49 and 35LNC50, whereas there is only one taxon (dolphins) represented at 35LNC49 that is not present at 35LNC62. The same basic range of marine and terrestrial habitats was exploited from both localities. Table 8-10 shows the distribution of major taxonomic categories of fauna between the two localities.

In assessing the differences between the fish assemblages and, to some extent, the bird assemblages, it is necessary to remember that different mesh sizes were used in recovering these faunal remains. The number of fish, bird, and small mammal bones recovered will be considerably higher using the smaller mesh size, and therefore the fish and bird assemblages from the various sites are seen as being quantitatively non-comparable.

Table 8-10. Summary of identified vertebrate fauna represented at Yaquina Head sites.

Taxon	35LNC62	35LNC49/ 35LNC50	Total
Terrestrial mammals	90 (2.1%)	30 (3.1%)	120
Marine mammals	103 (2.4%)	125 (13.0%)	228
Unidentifiable mammals	1436 (33.0%)	706 (73.5%)	2142
Fish	2040 (46.9%)	53 (5.5%)	2093
Birds	677 (15.6%)	46 (4.8%)	723
TOTAL	4346	960	5306

Table 8-11. Chi square test of terrestrial and marine mammals at Yaquina Head sites.

Taxon	35LNC62	35LNC49/ 35LNC50	Total
Marine mammals	115 (138.08)*	125 (101.92)	240
Terrestrial mammals	95 (71.92)	30 (53.08)	125
TOTAL	210	155	365

* expected frequencies in parentheses   Chi square = 25.12

Marine and terrestrial mammals are fairly evenly represented at 35LNC62, while at 35LNC49 and 35LNC50 marine mammals are much more strongly represented than terrestrial mammals. Table 8-11 is a Chi square contingency table showing this difference to be statistically significant at the .01 level of significance.

Review of the distributions of species represented at the three sites (Tables 8-1, 8-3, and 5-1) points out the striking difference in the number of harbor seals in the assemblages. Only 3 specimens of harbor seal were present at 35LNC62, while 35LNC49 and 35LNC50, which together have a much smaller faunal assemblage than does 35LNC62, have a total of 75 specimens representing harbor seal. The number of otarid (sea lion and fur seal) bones relative to phocid (true seals, including

Table 8-12. Chi square test of phocid and otarid mammals at Yaquina Head sites.

Taxon	35LNC62	35LNC49/ 35LNC50	Total
Phocids (true seals)	3 (20.68)*	75 (57.32)	78
Otarids (eared seals)	32 (14.32)	22 (39.68)	54

* expected frequencies in parentheses   Chi square = 50.40

harbor seals) bones is much higher at 35LNC62, and significantly lower at 35LNC49 and 35LNC50. Table 8-12 is a Chi square contingency table showing this difference to be statistically significant.

The greater number of harbor seals represented at 35LNC49 and 35LNC50 may be a function of the location of those sites to the north of the headland. Sites 35LNC49 and 35LNC50 are situated near an easily accessible beach, unlike 35LNC62. Although harbor seals haul out on the rocks offshore below the headland, they are also very commonly found near shore, as long as they are undisturbed; harbor seals are very wary, and easily scared off their hauling grounds. They are much more likely to haul out on the mainland than are the sea lions (Mate 1984:438-439).

SUMMARY

The function of 35LNC49 and 35LNC50 in terms of the settlement and subsistence practices of the late prehistoric inhabitants of the central Oregon coast remains unclear. The most simple interpretation would be that these two shell middens accumulated as a result of use as short-term campsites. This interpretation would account for the differences observed in the vertebrate faunal assemblages found at the two sites. These differences might reflect either occupation during a different period of time (i.e., several centuries apart), or during a different season of the year.

An alternative possibility is that these two shell middens together represent a prehistoric village complex. Although the cultural deposits appear, based on limited testing, to be relatively shallow, the sites' advantageous setting would seem to be ideal for more intensive occupation. If this interpretation is correct, the differences observed between the two faunal assemblages may simply reflect the existence of different activity areas at the same extensive settlement. Village complexes comprised of two or more nearby shell middens containing housepits are known to occur in similar settings elsewhere along the Oregon coast (Minor 1986:52-58). Ultimately, of course, a determination of whether 35LNC49 and 35LNC50 represent campsites or parts of a village can only be arrived at as a result of further investigations at these two sites.

CHAPTER 9

PREHISTORIC USE OF YAQUINA HEAD

Previous evaluations of the archaeological site on Yaquina Head have focused primarily on the shell midden located along the headland's north face. The results of archaeological investigations in 1986 indicate, however, that substantial evidence of prehistoric occupation is present in cultural deposits lacking shell remains. Non-shell occupations occurred both above and below the shell midden at this site. A consideration of the manner in which prehistoric peoples made use of Yaquina Head must necessarily take into account the differing nature of the cultural components represented.

YAQUINA I

The earliest use of Yaquina Head by prehistoric peoples apparently began at least 5000 years ago, as indicated by the earliest radiocarbon date of 5030 ± 80 BP. The Yaquina I component is represented by cultural materials recovered from below the shell midden, within sediments designated Stratum 3. Radiocarbon dates of 3360 ± 100 BP and 3740 ± 110 BP were obtained from charcoal from this stratum.

As discussed in Chapter 2, sea level is estimated to have been at -10 m 5000 years ago, gradually rising to -4 m at 3000 BP. Sea level was thus considerably below its present level at the time of the initial occupation at Yaquina Head. Based on the geomorphological reconstruction of the site setting, initial occupation occurred within sandy eolian deposits that covered the top of the headland. Because the source of these sandy deposits is no longer apparent, it was suggested that during this period of lower sea level a sediment apron existed that allowed sand from the beach below to be pushed upward by onshore winds to the headland above.

Artifacts recovered from the excavation units dug into Stratum 3 included only one chert core and 68 pieces of chipped stone debitage. The vertebrate fauna recovered from this stratum indicate that terrestrial mammals, marine mammals, fish, and birds were all exploited during Yaquina I times. The size of the faunal sample from Stratum 3 is quite small, and the sample does not exhibit diversity as great as that of the later strata. Nonetheless, the assemblage does demonstrate that a variety of nearby habitats was being exploited during the early occupation at Yaquina Head, and that there was clearly a marine as well as a terrestrial orientation at this time.

It is possible that the small number of faunal specimens recovered from Stratum 3 might in part be a function of poor preservation resulting from the lack of shell. However, the fact that a correspondingly small number of lithic artifacts was also recovered from this stratum strongly suggests that the sparseness of the occupation represented by the Yaquina I component was real, and not merely a function of preservation.

The most recent radiocarbon date from Stratum 3 is 3360 ± 100 BP. A terminal date of approximately 3200 BP is suggested for Yaquina I, based in part on the earliest radiocarbon dates for the occurrence of marine shell at this site, which marks the initial date of the next component.

YAQUINA II

Beginning sometime around 3200 years ago the inhabitants of Yaquina Head began intensive exploitation of molluscan resources. The shell midden at this site was designated Stratum 2, with subdivisions into a later deposit (Stratum 2A) and an earlier deposit (Stratum 2B) recognized in some excavation units. Radiocarbon dates of 2670 ± 70 BP, 2980 ± 70 BP, 3110 ± 100 BP, and 3120 ± 60 BP based on charcoal were obtained from Stratum 2, suggesting that deposition of the shell midden took place between roughly 2600 and 3200 years ago.

A non-shell deposit, designated in the field as Stratum 1, overlies the shell midden along the northern edge of the headland, and also borders the shell midden on three sides, extending for an unknown distance across the top of the headland. Radiocarbon dates of 2310 ± 60 BP and 2880 ± 90 BP from this stratum were obtained from excavation units close to the cliff face. Slightly older radiocarbon dates of 2930 ± 90 BP and 3200 ± 70 BP were obtained from units farther inland. These dates indicate that this stratum is basically contemporaneous with the shell midden, Stratum 2 (Figure 9-1). The infant burial, Feature 5, is also assigned to Stratum 1. A radiocarbon date of 3400 ± 240 BP was obtained from the whale bone artifact associated with this burial. Within one standard deviation, this date fits into the overall time interval assigned to Component II.

In view of the closeness of the radiocarbon dates from these two deposits, the cultural materials from Stratum 1 and Stratum 2 together form the cultural component Yaquina II. As discussed in the radiocarbon dating section, the date of 2310 ± 60 BP from Stratum 1 was obtained from Feature [illegible] situated between two shell bands. The provenience of the charcoal on which this date was based below a shell band indicates that some use of shellfish occurred at this site after 2300 BP. The radiocarbon dates from Stratum 1 were obtained from contexts ranging from 30-40 cm to 100-110 cm below the ground surface. Using these dates as a frame of reference, and considering that some

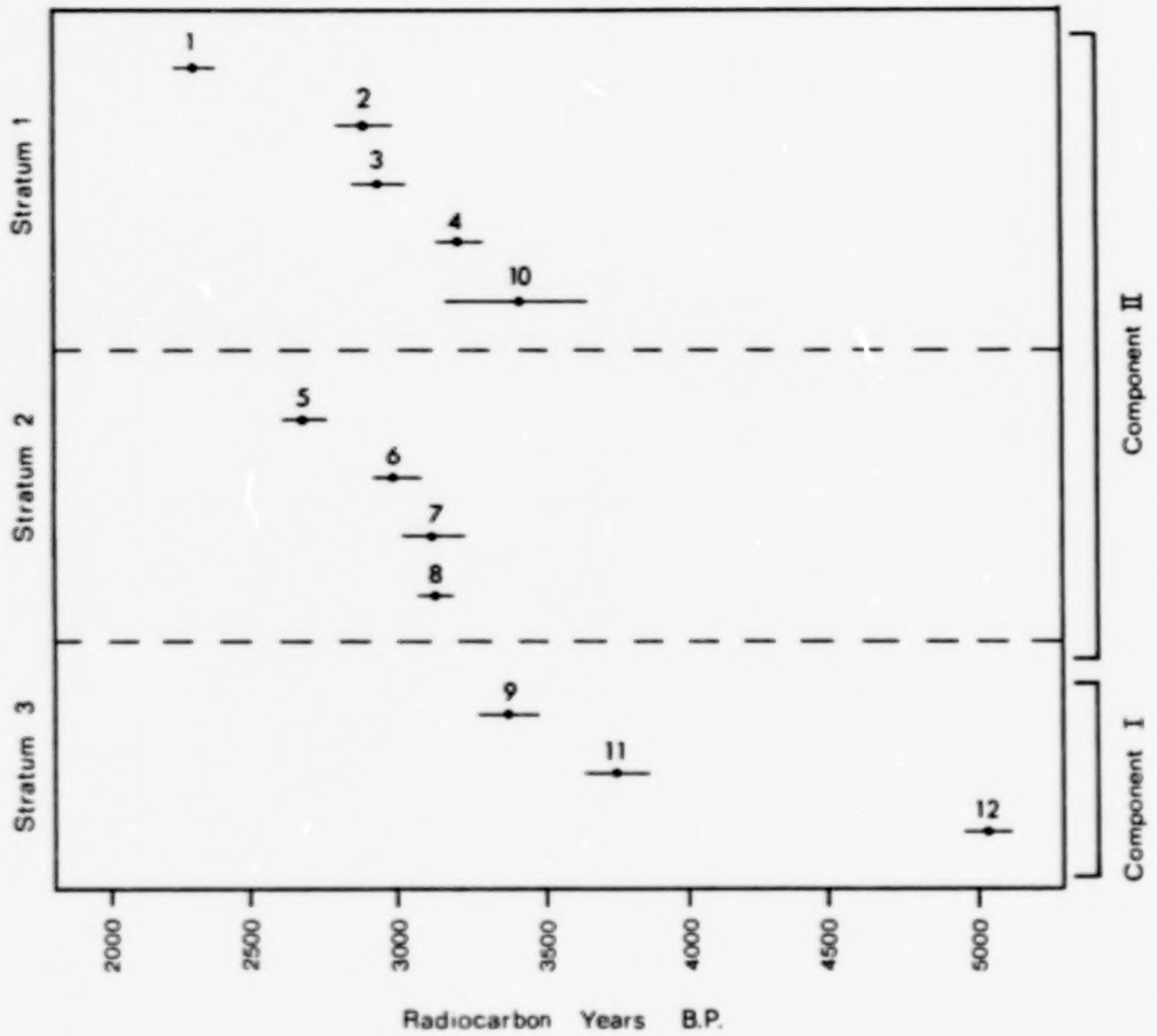


Figure 9-1. Distribution of radiocarbon dates from Yaquina Head (one standard deviation shown).

accumulation of culture-bearing sediments occurred above the contexts from which these dates were obtained, it seems reasonable to suggest that prehistoric use of the portion of Yaquina Head investigated during this project probably ceased by around 2000 years ago. Overall, then, a time range from 3200 to 2000 BP is suggested for the Yaquina II component.

The Yaquina II component contained several cultural features that were intrusive, apparently originating in Stratum 1 deposits, and dug into or through underlying Stratum 2 shell deposits. Specifically, this seems to have been the case with the semisubterranean housepit and the two human burials. The presence of these features suggests a relatively high degree of permanency during the occupation represented by this component.

During Yaquina II times, sea level is estimated to have risen to the neighborhood of -4 m to -2.5 m (McDowell 1986). This relative rise in sea level would have resulted in the gradual erosion of the hypothesized sand apron. At the same time, the persistence of the sand apron, although gradually diminishing in size due to erosion, would have permitted the site's inhabitants greater access to marine resources in the rocky intertidal zone than is possible given the steep cliffs that exist along the headland today. A greater access to the rocky environment below the headland is strongly reflected in the faunal remains, which show an intensive use of intertidal species. Based on the seasonal patterning in sand deposition along the Oregon coast, it is thought that the most likely position for this sand apron was on the north flank of the headland. This area of the headland, of course, is where the main concentration of shell midden is located.

Stratum 1 (Non-Shell Deposit)

Stratum 1, the non-shell deposit, contained the majority of the artifacts recovered from Yaquina Head. Flake tools included a stemmed and notched chert projectile point, a drill tip, a flake knife, five bifaces, two scrapers, three gravers, and five used flakes. Cobble Tools included two hammers, one anvil, one grinding stone, two choppers, and three used cobble flakes. Seven cores and 2321 pieces of chipped stone debitage were also recovered. Bone/antler tools were relatively rare, consisting only of one awl, one antler beam wedge, one worked bone, and the carved whale bone artifact associated with the infant burial.

The faunal assemblage from Stratum 1 is considerably more restricted than that from Stratum 2 in both abundance of bone and diversity of species. Nonetheless, the Stratum 1 assemblage suggests exploitation of a similar range of habitats as Stratum 2, showing utilization of large terrestrial mammals, marine mammals, fish from both the intertidal rocky shore habitat and the nearshore rocky reefs, and hunting of birds on both land and water.

Stratum 2 (Shell Midden)

The shell midden, designated Stratum 2 in the field, is composed primarily of sea mussel, with horse barnacle, piddock, and goose barnacle also well represented. In all, 23 different species of molluscs were found in the shell midden at Yaquina Head.

A wide variety of vertebrate fauna was represented in the shell midden as well, indicating use of a variety of different habitats in

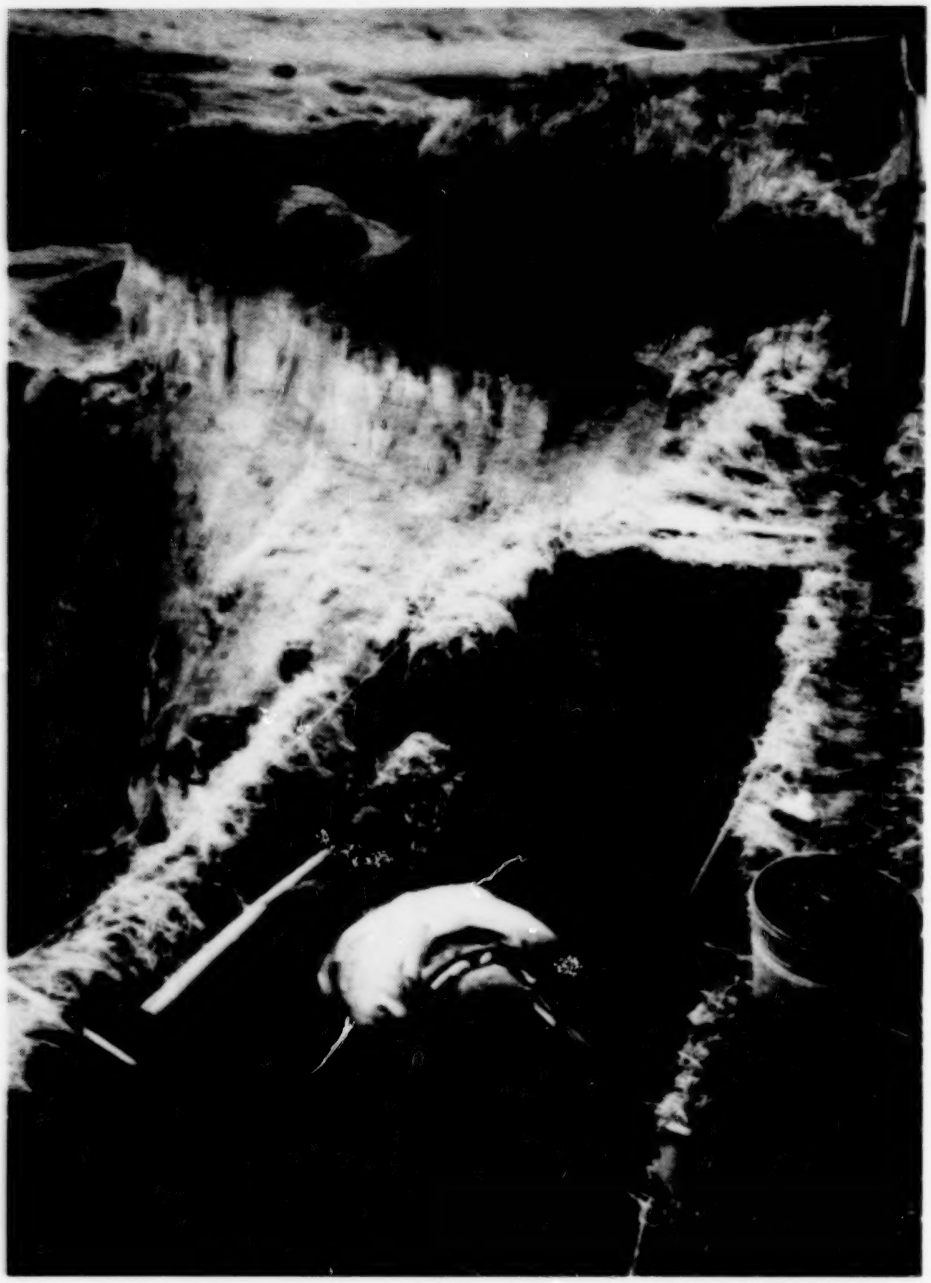


Figure 9-2. View of excavations in progress in Units A/B/M/N with the dark sand of Stratum 1 visible in the exposed cliff face.

the Yaquina Head area. Terrestrial mammals include deer, elk, dog or coyote, mink, hares or rabbits, beaver, and some smaller rodents. Marine mammals include harbor seal, Steller and California sea lion, northern fur seal, whale, and sea otter. Fish include ratfish, herring, salmon, hake, tomcod, surfperches, rockfish, greenlings, lingcod, sculpins, and flatfish, including halibut. Birds recovered include loons, western grebe, albatross, shearwaters, fulmar, cormorants, merganser, scaup, scoters, geese, coot, sandpiper, gulls, terns, alcids, crow and raven, and perching birds.

The shell-bearing component contained a wide variety of stone artifacts. Flake tools included an obsidian lozenge-shaped projectile point, three flake knives, eight bifaces, two scrapers, three gravers, and six used flakes. Cobble tools included four hammers, two anvils, a chopper, and three used cobble flakes. Five cores and 853 pieces of chipped stone debitage were also recovered. Bone and antler artifacts were well preserved within the shell matrix, with 19 specimens recovered in all. Included were seven awls, two needles, two wedges, one net shuttle, two antler tine wedges, two antler beam wedges, 2 pieces of worked bone, and one piece of decorated bone. Rounding out the assemblage from Stratum 2 were 26 abraders used in fashioning bone and antler tools, and two possible shell beads.

STRATA 1 AND 2 COMPARISONS

Although apparently contemporaneous, Strata 1 and 2 are areally distinct, both horizontally and vertically. And, in addition to their definitive difference--the presence or absence of shell--there are some significant differences between these strata with respect to their artifactual and faunal assemblages.

The most striking difference between the two strata is that Stratum 1 contained 2.5 times more artifacts than did Stratum 2, while Stratum 2 contained nearly five times as many faunal specimens as Stratum 1. It could be argued that the Stratum 1 sediments, lacking shell, were a less favorable environment for the preservation of bone in comparison to the shell midden. However, the pH of the Stratum 1 sediments is close to neutral (7.2 and 6.8 in samples from Units B and G, respectively), as compared with the only slightly more alkaline Stratum 2 sediments (7.6 and 7.8). These pH values are significantly more alkaline than those obtained from an auger hole core taken off the site altogether, which ranged from 4.8 to 5.5 (see Table 2-2). Given that the pH in the cultural deposit is close to neutral or mildly alkaline, regardless of the stratum (see Table 2-1 and 3-2), it seems unlikely that the lesser amount of bone in Stratum 1 is a function of differential preservation. Rather, the variable distribution of bone between the two strata seems to be attributable to cultural factors.

The relative proportions of classifiable artifacts versus lithic

Table 9-1. Comparison of artifacts and debitage in Strata 1 and 2.

	Stratum 1	Stratum 2
Classifiable artifacts	58 2.4%	85 9.1%
Lithic debitage	2321 97.6%	853 90.9%
TOTAL	2379	938

debitage recovered from Strata 1 and 2 are compared in Table 9-1. Comparison of the relative abundance of the items in each of the major artifact classes (Table 9-2) indicates that the assemblages from these two strata compare fairly closely. The most significant differences between the two strata are in the far higher frequency of debitage in Stratum 1, and in the much larger number of bone, antler, and shell artifacts in Stratum 2. Again, the more frequent occurrence of bone, antler, and shell artifacts in Stratum 2 is not thought to be a function of preservation. Instead, it is considered more likely that the higher frequency of these artifacts in Stratum 2 reflects differential use of the two areas of the site.

It is also noteworthy that although Stratum 1 and Stratum 2 differed significantly in the frequency of debitage, the proportions observed in the raw materials, flake classes, presence/absence of cortex, and flake sizes are very consistent between the strata (see

Table 9-2. Comparison of major artifact classes from Strata 1 and 2.

	Stratum			
Artifact Class	1		2	
Flake Tools	18	(31.0%)	23	(27.1%)
Cobble Tools	9	(15.5%)	10	(11.8%)
Cores	7	(12.1%)	5	(5.9%)
Abraders	21	(36.2%)	26	(30.6%)
Bone/Antler/Shell Tools	3	(5.2%)	21	(24.7%)
TOTAL	58		85	

Chapter 7). The proportional consistency exhibited in the debitage at Yaquina Head strongly suggests that the same types of flintknapping activities were conducted in both strata, although to a considerably lesser extent within the shell midden deposits. The debitage analysis thus suggests, not too surprisingly, that flintknapping was not strongly related in any strong way to the shell gathering and processing in evidence at the site.

Although the majority of the artifacts recovered from Yaquina Head were found in Stratum 1, only 16.5% of the faunal remains were recovered from this stratum, as compared with 79.8% from Stratum 2. As mentioned above, it is often thought that the presumed greater soil acidity in non-shell strata is responsible for differential preservation of bone. However, in the present case, differential preservation is considered an unlikely cause of the sharp differences in the proportions of bone and lithic debris between these two strata, primarily because the soil chemistry does not support this assumption.

In order to make an independent assessment of the degree of preservation of bone, the percentage of unidentifiable bones was compared between the two strata. In general, poorly preserved bone tends to be less identifiable than better preserved specimens. The percentage of an assemblage that was classified as unidentifiable may therefore serve as a rough index of the degree of preservation of the bones. In Stratum 1, 48.3% of the assemblage was considered unidentifiable, as compared with 41.9% in Stratum 2. This difference of less than 7 percent seems unlikely to account for the fact that the amount of bone in Stratum 2 is nearly five times greater than that in Stratum 1.

In addition to the striking difference in the amount of bone between the two strata, there is less diversity of taxa represented in Stratum 1 than in Stratum 2 (see Table 5-1). The only taxon present in Stratum 1 that is not present in Stratum 2 is grouse, which is represented by only one specimen in Stratum 1. In contrast, there are 29 taxa represented in Stratum 2 that are not in Stratum 1. In general, the diversity of faunal assemblages declines with decreasing sample size (Grayson 1984). This situation may in part account for the smaller number of taxa represented in Stratum 1.

SEASONALITY

Shellfish

An idea of the time of year during which prehistoric peoples occupied Yaquina Head can be obtained from the shellfish recovered. Analysis of the growth rings on shellfish has been shown to be a reliable means of estimating the season of occupation at archaeological sites (Ham and Irvine 1975; Ham 1976; Keen 1979). In bivalves, shell growth occurs on the ventral edge of the shell when the valves are open collecting food.

A growth ring or layer is defined as two surfaces that vary in color from the previous growth layer, as a result of a change in the rate of deposition of calcium carbonate. The deposition rate of calcium carbonate is influenced by physical or chemical changes in the environment (Wilbur 1964). Variation in growth rings found in marine molluscs is explained as the result of changes in food supply and water temperatures over the course of the year. A light wide ring develops during the spring and summer when shell growth is greatest, while a dark thin ring is formed in the winter when growth rates decline (Ham and Irvine 1975; Keen 1979).

Ham and Irvine (1975) discuss four techniques for studying growth rings, one of which has been used here. This technique involved sawing a valve in half lengthwise and polishing the transverse section. A solution of methylene blue was then applied to the polished section. The solution was more readily absorbed by the light-colored, less dense summer growth rings, making them stand out from the darker winter check rings. A Swift binocular microscope (7-30x) was used to help distinguish the winter check rings from the spring and summer growth. By examining the growth rings on the surface of the transverse section, using the most recent winter check ring and subsequent growth, the approximate season of death was estimated.

The 29 valves used for the seasonality study were selected from the grab samples. All of the whole or nearly whole valves of butter clam, littleneck clam, horse clam, and cockle were used. The shells of sea mussels, which were the dominant constituent of the midden, are generally considered to be too fragile to provide reliable results for this kind of analysis.

The season of death was inferred using the percentage of growth of the valve's most recent annual growth band as compared to the previous growth band. Several different interpretations of the percentages and their relationship to the season of death have been suggested (Ham and Irvine 1975; Keen 1979; Wesson 1982; Hurst 1986). One interpretation (Wesson cited in Hurst 1986) of the relationship between percent of growth and seasonality was used here because it is somewhat more generalized and is probably more appropriate for the small sample size of the present study. The percent of growth in relation to seasonality is interpreted as follows:

0-30% = late winter to early spring
30-70% = late spring and summer
70-85% = fall
85-100% = early winter

The results and interpretations of the season of death for the selected valves are presented in Table 9-3. Approximately 76% of the valves from Stratum 2 were interpreted as having a late winter season of death. The transverse section of these valves shows a winter check ring on the margin of the shell with no subsequent growth. The remaining valves from Stratum 2 fall into the spring and summer categories.

The seasonality data obtained from the growth ring analysis thus strongly suggest a late winter occupation for Stratum 2. It should be noted, however, that the species used for the seasonality study all favor protected water habitats and are very minor constituents of the midden. Although considered unlikely, there is some possibility that these shells were collected for use as utensils at another, more protected location, and carried to this site during a seasonal movement to Yaquina Head. It is thus important to consider the results of the growth ring analysis on shellfish in relation to other data on seasonality available from this site.

Vertebrate Fauna

Certain species represented in the vertebrate faunal remains also can be used to infer the time of year during which Yaquina Head was occupied by prehistoric peoples. Of the large terrestrial mammals, elk can be used to suggest seasonality. Elk are present along the Oregon coast throughout the year, but tend to be at low elevations more commonly in the winter and fall (Graf 1943; Adams 1982), which is reportedly when aboriginal elk hunting most commonly took place (McCabe 1982:80).

Several of the marine mammal specimens recovered from the site are also good seasonal indicators. The 10 or 11 week old *Callorhinus ursinus* material is a good indication of occupation in the late summer or early fall occupation, probably September, considering that this species gives birth in June or July. The adult male *Eumetopias jubatus* specimens are indicators of summer or early fall occupation, when they are present at Oregon rookeries before beginning their northward migration. The adult male *Zalophus californianus* specimen indicates fall or winter, which is the time these sea lions pass along the Oregon coast on their way from California breeding grounds to British Columbia, where they overwinter. It should be noted that use of sea lions as seasonal indicators is based on the assumption that their distributions in the prehistoric past were similar to those of today. Given the evidence from Yaquina Head that northern fur seal breeding and pupping grounds have changed, this may not be a valid assumption.

Only one of the fish species recovered may aid in making seasonal interpretations. Herring were most likely caught in the winter, when they are spawning near shore.

A number of the bird specimens are useful in reconstructing season of site occupation. Although the gulls, common loon, common murre, and cormorants are potentially available in the Yaquina Head vicinity throughout the year, other species are more seasonal in their distribution. Scoters may be in the area throughout the year, but they are

Table 9-3. Seasonal interpretation from growth ring analysis.

Level/Stratum	Species	Growth	Inferred Season
5/2	Saxidomus giganteus	65%	summer
5/2	Saxidomus giganteus	38%	late spring
7/2	Saxidomus giganteus	0%	late winter
7/2	Tresus capax	17%	early spring
8/2	Protothaca staminea	0%	late winter
9/2	Saxidomus giganteus	47%	summer
9/2	Saxidomus giganteus	0%	late winter
9/2	Saxidomus giganteus	0%	late winter
9/2	Saxidomus giganteus	0%	late winter
9/2	Saxidomus giganteus	0%	late winter
11/2	Saxidomus giganteus	0%	late winter
11/2	Saxidomus giganteus	0%	late winter
12/2	Saxidomus giganteus	19%	early spring
13/2	Clinocardium nuttalli	0%	late winter
14/2	Saxidomus giganteus	0%	late winter
14/2	Saxidomus giganteus	0%	late winter
14/2	Saxidomus giganteus	0%	late winter
14/2	Clinocardium nuttalli	0%	late winter
15/2	Clinocardium nuttalli	10%	late winter
15/2	Saxidomus giganteus	0%	late winter
15/2	Saxidomus giganteus	0%	late winter
15/2	Saxidomus giganteus	0%	late winter
15/2	Saxidomus giganteus	15%	early spring
15/2	Protothaca staminea	0%	late winter
15/2	Protothaca staminea	0%	late winter
15/2	Protothaca staminea	0%	late winter
15/2	Protothaca staminea	0%	late winter
15/2	Protothaca staminea	0%	late winter
13/2B	Saxidomus giganteus	55%	summer

uncommon in the summertime. Marbled murrelets also may be present throughout the year, but are uncommon in the fall, winter, and spring. The merganser is present except during the summer, and so is the rhinoceros auklet, which is more common in the spring than in the winter and fall, and the scaup and the western grebe, which are more common in the winter than in the spring and fall. The albatross and the shearwaters are most abundant in the summer, but may also be present in fall and spring. The fulmar is present only in the fall and winter. The sandpiper and geese are in the vicinity only in the fall and spring, and the arctic and red-throated loon are present only in the wintertime.

A summary of the seasonal availability of indicator species identified from Yaquina Head is presented in Table 9-4. The data shown in this table, plus the data obtained from the shell growth ring analysis, indicate that the site was probably occupied during all seasons of the year. It is not clear from these data alone whether continuous, year-round occupation of the site occurred, or whether the site was visited for shorter periods at various times throughout the year.

INTERPRETATION

Given the basic contemporaneity of Strata 1 and 2, it seems likely that these two strata represent different aspects of one overall occupation, rather than two sequential occupations. The differences between the two strata may reflect different seasonal patterns, or they may be a function of different activity areas within the site.

In order to test for the possibility of Strata 1 and 2 representing different seasons of occupation, a chi square contingency table (Table 9-5) was constructed comparing the two strata with respect to the number of species indicating basically winter occupation (grebe, fulmar, scaup, scoter, merganser, rhinocerous auklet, and adult male California sea lion) with the number suggesting basically summer occupation (albatross, shearwater, marbled murrelet, adult male Steller sea lion, 10-11 week old northern fur seal). Chi square for this comparison is not significant at the .01 level of significance; statistically there is no difference between the seasonal indicators in Stratum 1 and those in Stratum 2. Thus, it appears that the two strata do not represent different seasonal use of the site area.

Rather, it seems likely that the basically contemporaneous shell and non-shell strata represent two different aspects, or activity areas, within one occupational component. The differences in the faunal and lithic assemblages between the two strata appear to be more quantitative than qualitative. In other words, the relative frequencies of categories of artifacts and fauna vary between strata, but there is no evidence of differences in basic adaptive strategies. Instead, it seems that the shell stratum primarily represents a garbage dump and perhaps food processing area, whereas Stratum 1 represents places where other activities, such as stone tool manufacture, took place.

Because many of the shell middens along the Oregon coast appear to represent short-term campsites where shellfish and other resources were procured, it was initially assumed that the site on Yaquina Head had a similar function. The presence of at least one semisubterranean housepit, as well as the seasonality data derived from the marine shell and vertebrate fauna, suggest that occupation occurred on a more permanent basis. In addition, the recovery of human burials also suggests a relative degree of permanency in occupation. While the two burials

Table 9-4. Seasonal availability of indicator species identified among the vertebrate fauna at Yaquina Head.

Taxon	WINTER	SPRING	SUMMER	FALL
BIRDS				
Small loon	———			
Western grebe	———	- - -		- - -
Albatross		- - -	———	- - -
Fulmar	———			———
Shearwaters		- - -	———	- - -
Merganser	———	———		———
Scaup	———	- - -		- - -
Scoters	———	———	- - -	———
Geese		- - -		- - -
Sandpiper		———		———
Rhinoceros auklet	- - -	———		- - -
Marbled murrelet	- - -	- - -	———	- - -
MARINE MAMMALS				
Steller sea lion (adult male)			———	- - -
California sea lion (adult male)	- - -			———
Northern fur seal (10-11 weeks old)			- - ——	—— - -
TERRESTRIAL MAMMALS				
Elk	- - -	- - -	- - -	———
FISH				
Herring	———	- - -		- - -

Table 9-5. Chi square test, winter and summer indicators in Strata 1 and 2.

	WINTER	SUMMER	TOTAL
STRATUM 1	4 (4.7)*	7 (6.8)	11
STRATUM 2	28 (27.3)	36 (36.7)	64
TOTAL	32	43	75

* expected frequencies in parentheses   Chi square - 0.2

found at Yaquina Head appear to have been unrelated, the occurrence of multiple burials at archaeological sites usually correlates with settlements occupied on a more permanent basis. Considered altogether, the available evidence leads to the conclusion that the settlement on the tip of the headland served as a village during Yaquina II times.

SITE ABANDONMENT

The available radiocarbon dates indicate that the prehistoric settlement on Yaquina Head ceased to be occupied around 2000 years ago. This inference is supported by the fact no projectile points or other temporally-diagnostic artifacts characteristic of late prehistoric occupation were found, nor were any historic trade items introduced as a result of contact with Euro-Americans recovered. In view of the fact that the rocky intertidal zone below Yaquina Head appears to be a productive environment for both vertebrate and molluscan resources at the present time, why did prehistoric peoples no longer occupy the settlement on top of the headland? Explanations of the abandonment of prehistoric settlements in coastal settings have generally focused on two possibilities: (1) overexploitation of subsistence resources; or (2) environmental change.

The first possible explanation is that overexploitation of subsistence resources may have lead to their depletion, with the site's inhabitants then moving to a more favorable location for settlement. This explanation, for example, has been proposed to account for abandonment of coastal sites in California (Meighan 1959:402; Botkin 1980). In these cases, the inference regarding resource depletion was

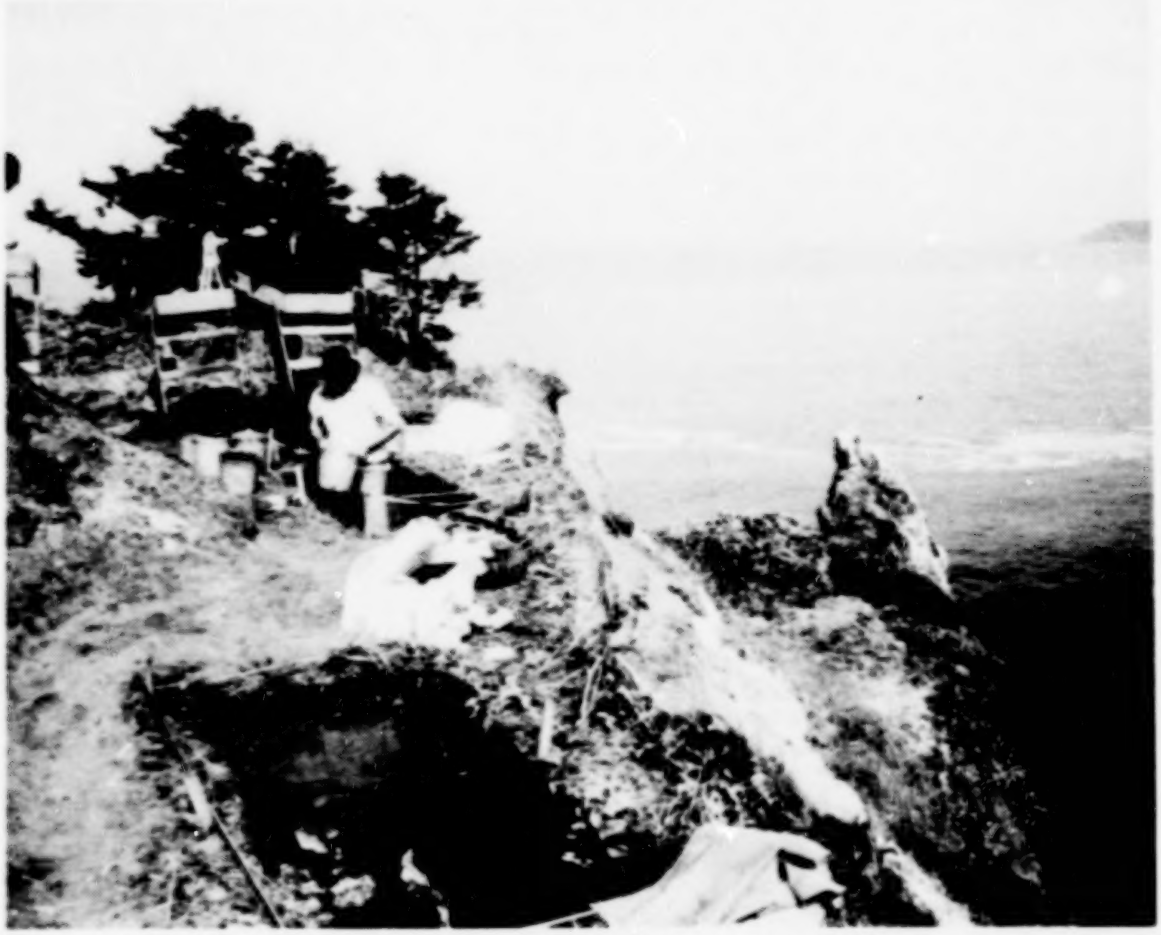


Figure 9-2. Excavations in progress adjacent to cliff edge at Yaquina Head with ocean in background.

based on changes in the frequency of certain molluscan species, specifically mussels versus little-necked clams, in these shell middens over time. The results of midden analysis, however, do not indicate any strong changes in the frequency of the molluscan species exploited at Yaquina Head, as sea mussel is by far the most common species represented throughout the samples analyzed. Thus, no direct evidence of the overexploitation of shellfish is apparent at Yaquina Head.

The second possible explanation, that site abandonment occurred in response to environmental change, may be more applicable to the situation at Yaquina Head. A change in the beach environment, with sandy eolian deposits eroding away over time, may have had an effect on the availability of various species inhabiting the rocky intertidal zone. A rocky intertidal zone continues to occur below the headland at the present time, and thus it does not appear that any major change has occurred in this aspect of the environment within the last 2000 years. However, it is possible that erosion of the headland over time may have resulted in reduced access to the rocky intertidal zone below.

Yaquina Head was formed as a result of the constant erosional forces of wind and water bearing on the sediments and bedrock composing the headland. It seems reasonable to suggest that the pace of this erosion has increased correspondingly as sea level has risen in post-glacial times. As mentioned in Chapter 2, modern rates of erosional retreat along the Oregon coast are moderate to fast (probably <1 m/year) on Quaternary sediments like the sand dunes on top of the headland (McDowell 1987). At the present time, landslide-prone bluffs and steep cliffs occur all along the headland's shoreline and, together with the obvious erosion apparent at the archaeological site along the north face, these features provide strong evidence of the dynamic nature of the headland's landscape. Even if a conservative rate of erosion is projected, it is easy to envision that several hundred square meters, and perhaps even more, of the headland have eroded into the sea within the last 2000 years.

Erosion of the headland may in turn have affected the natural vegetation on top of Yaquina Head. At the present time, the headland is covered by a complex mixture of herb- and shrub-dominated plant communities like those found on other major bluffs and headlands along the central and northern Oregon coast. Early photographs of the lighthouse, however, indicate that a substantial stand of trees existed on the headland's northwest tip (see Figure 1-2). These were presumably Sitka spruce and lodgepole pine trees, some of which still survive in that portion of the headland today. Yaquina Head is usually windy, with constant velocities averaging 15 to 20 miles per hour most of the year. On occasion, winds reach velocities of 75 to 100 miles per hour (Bureau of Land Management 1983:10). In view of this situation, it is easy to imagine that the stand of trees on the tip of the headland would have been important as a windbreak for the prehistoric site's inhabitants. Any reduction of the size of this stand of trees, such as might have occurred as a result of steady erosion, may have contributed over the long run to the headland's becoming a less desirable setting for human occupation.

While the presently available evidence is limited, it nevertheless seems reasonable to suggest that changes in the headland's environment, most likely as a result of ongoing erosional processes, may have lead to the abandonment of the prehistoric settlement on Yaquina Head. The prehistoric inhabitants presumably moved to another site in a more favorable location, where subsistence resources were abundant and some protection was available from the elements. A likely location for a new settlement would have been at 35LNC49 and 35LNC50, situated about 0.6 km to the northeast in the lee of Yaquina Head (see Chapter 8). Located at the mouth of a small creek, these sites are situated in proximity to marine resources as well as fresh water and, in addition, would have been sheltered by the headland to some extent from winter storms carried on southerly winds. A single radiocarbon date of 1150 ± 50 years BP from 35LNC50 is consistent with the idea that occupation may have taken place at these sites consequent to the abandonment of 35LNC62 on the tip of Yaquina Head.

CONCLUSION

Archaeological investigations at Yaquina Head indicate that the headland was first occupied as early as 5000 years ago. Initial occupation of the site was sparse, but involved use of various marine and terrestrial habitats in the vicinity of the headland for resource exploitation. The faunal materials recovered from Yaquina I (5000-3200 BP) lack the large numbers of seasonal indicators present in the later component. The only season that is definitely indicated is summer and, considering the sparseness of the cultural remains, the site was probably used as an occasional seasonal encampment at that time.

Around 3200 years ago more intensive use of the headland area began, including exploitation of marine molluscs, particularly mussels. During Yaquina II times (3200-2000 BP), Yaquina Head was occupied throughout the year, and was the site of an aboriginal village with semisubterranean housepits. A wide range of subsistence and manufacturing activities took place at the site during this period. A variety of marine and terrestrial habitats were exploited for resource procurement.

By 2000 years ago, the settlement on Yaquina Head had been abandoned, very likely as a result of changing conditions at the headland caused by erosional forces. A later occupation of 35LNC49 and 35LNC50, situated to the northeast, in the lee of the headland, may have been established in response to the abandonment of 35LNC62. The conclusion that the settlement on the tip of Yaquina Head was abandoned by 2000 years ago is noteworthy in view of the information available on the native peoples who inhabited this area at the time of historic contact. While these records are admittedly incomplete, it is probably significant that this headland, one of the most prominent landmarks on the Oregon coast, is not mentioned in the surviving ethnography and folklore of the Yaquina and closely related Alsea Indians (cf. Dorsey 1889, 1890; Farrand 1901; Frachtenberg 1917, 1920; Drucker 1939).

CHAPTER 10

YAQUINA HEAD IN REGIONAL PERSPECTIVE

With seven of its twelve radiocarbon dates in excess of 3000 years old, Yaquina Head is now the second oldest archaeological site so far documented along the Oregon coast. Archaeological investigations at Yaquina Head have contributed new and significant information about prehistoric occupation on the Oregon coast. Aspects of regional prehistory illuminated as a result of these investigations include environmental change, settlement patterns, subsistence practices, and mortuary customs.

ENVIRONMENTAL DYNAMICS

Until recently, the known antiquity of human occupation (as demonstrated by radiocarbon dating) along the Oregon coast only went back as far as 3000 years ago. With few apparent exceptions, the sites investigated appeared to reflect the existence of aboriginal cultures similar to those that inhabited the region at the time of historic contact. All of the shell middens previously investigated and reported appear to reflect occupation associated with the present environment. No significant changes over time, in either the setting or the faunal resources exploited by the native inhabitants, had yet been reported at any of the Oregon coastal sites then investigated.

This situation changed abruptly in 1985 as a result of excavations at Tahkenitch Landing, located roughly midway between Florence and Reedsport on the central Oregon coast (Minor and Toepel 1986). This site consists of a deep marine shell midden situated on the west shore of dune-dammed Tahkenitch Lake. Significantly, the prehistoric inhabitants of this site exploited marine molluscs, fish, and other resources characteristic of an estuarine environment, in a setting notably different from the freshwater lake that exists adjacent to the site today.

With initial use of the site beginning around 8000 years ago, Tahkenitch Landing has produced the earliest radiocarbon dated evidence of occupation along the Pacific coast between the Fraser River area in British Columbia on the north and the San Francisco Bay area in California on the south. Furthermore, the earliest evidence of the intensive exploitation of marine molluscs along this section of the Pacific coast, beginning around 5200 BP, was also found at this site. This age determination brings the known age of marine shellfish exploitation along the Oregon coast into line chronologically with the earliest radiocarbon dates available for shell middens on the coast of British Columbia (Fladmark 1975:243-246).

Two of the three cultural components at Tahkenitch Landing--comprising the main occupation--were older than any Oregon coastal sites from which radiocarbon dates had then been reported. Just as importantly, the three cultural components defined at Tahkenitch Landing document the transition of the area from a marine estuary to a freshwater lake (Table 10-1). Tahkenitch Landing is thus significant as representing the first well-documented case of substantial environmental change in the archaeological record for this region.

The environmental and archaeological sequence at Tahkenitch Landing is consistent with the results of various studies documenting a rise in sea level in postglacial times and its effects upon the environment of the Oregon coast. Along the central coast, this sea level rise is in evidence at freshwater Devils Lake in northern Lincoln County in a setting similar to that at Tahkenitch Lake. A pollen core from this lake produced evidence of a marine incursion between 6.5 m and 9.0 m. While the incursion itself was not directly dated, a radiocarbon determination was obtained from below this feature at 11.7 m, and on this basis it was estimated that the marine incursion occurred between 4000 and 6000 BP (Heusser 1960:98, 108, 190). Damming of Devils Lake by sand dunes, the same process that resulted in the formation of freshwater Tahkenitch Lake, thus apparently took place after 4000 years ago.

Another study documenting a postglacial sea level rise and its effects on the environment of the central Oregon coast has been carried out in Alsea Bay (Peterson, Scheidegger, and Schrader 1984:51-83). Using seismic reflection data and analysis of sediment cores from the bay floor, three stages of Holocene deposition were identified in this estuary. The study traces the history of the estuary from a shallow, high gradient, fluvial environment dated from 10,000 to 7500 BP, to a deep water estuarine environment dated from 7500 to 5000 BP, and finally to a shallow water estuarine environment like that of the present after 5000 BP. The shallow water in this last stage is the result of a decline in the rate of sea level rise after 6000 BP combined with a rapid rate of sedimentation, causing sediment accumulation in the basin. The rate of sedimentation slowed significantly after 5000 BP (Peterson, Scheidegger, and Schrader 1984:51-83).

That relative sea level continued to rise after 5000 BP and into historic times, however, is clearly demonstrated by the presence of archaeological sites with waterlogged components, or "wet sites," along the Oregon coast. At 35TI1 on the sandspit at Netarts Bay, a radiocarbon date of 550 ± 150 BP was obtained from cultural deposits that are presently inundated at high tide (Newman 1959:57-58, 63-64). Similarly, at 35TI4 on Nehalem Bay a fragment of native basketry recovered from submerged cultural deposits at approximately -6 m MSL

Table 10-1. Environmental and archaeological sequence at Tahkenitch Landing (after Minor and Toepel 1986).

Component	Estimated Timespan	C-14 Dates	Environmental Setting	Site Function
III	3000-130 BP	400 ± 50 BP 3090 ± 80 BP 4340 ± 80 BP*	freshwater lake	seasonal fishing camp
II	5200-3000 BP	3040 ± 80 BP 3120 ± 80 BP 3150 ± 60 BP 3160 ± 60 BP 3160 ± 90 BP 5100 ± 70 BP	shallow-water estuary	village
I	8000-5200 BP	6880 ± 80 BP 7960 ± 90 BP	deep-water estuary	seasonal fishing camp

*Date is inconsistent with its stratigraphic provenience

produced a radiocarbon date of 380 ± 60 BP (Woodward 1986:221-223). On the south coast, the Philpott site (35CS1) near the mouth of the Coquille River apparently contains a submerged component, as basketry and other artifacts made from organic materials have been found there by relic collectors. The submerged component has not been directly dated but is probably of late prehistoric age, as radiocarbon dates of 570 ± 50 BP and 250 ± 40 BP have been obtained from charcoal recovered during excavations in the dry cultural deposits at this site (Draper 1982:48). A few other archaeological sites with submerged components are known or suspected to exist along the Oregon coast, but the above-mentioned localities are the only "wet sites" from which radiocarbon dates are so far available.

In addition to the eustatic postglacial sea level rise resulting from the melting of continental glaciers, recent studies suggest that another factor contributing to relative sea level change in this region is tectonic activity along the Cascadia Subduction Zone (Heaton and Hartzell 1987). Evidence has been found of buried wetlands along the lower courses of rivers in western Washington that appear to have been created as a result of coastal subsidence associated with sizable earthquakes. It is estimated that such earthquakes may have occurred as many as six times in the last 7000 years (Atwater 1987).

This issue remains to be investigated along the Oregon coast. Most studies applicable to the Oregon coast suggest that postglacial sea levels rose rapidly until 5000 years ago, and then continued rising only slowly thereafter (Clark and Lingle 1979). In view of this situation, it might be expected that subsidence associated with tectonic activity would be most clearly in evidence at sites dating to late prehistoric times. In this respect, it seems reasonable to suggest that the change in relative sea level observed at "wet sites" along the Oregon coast, all of which apparently date within the last few hundred years, may in fact be related to tectonic activity.

Although the effects are not nearly so clearcut as at Tahkenitch Landing, a case has been made that postglacial sea level rise also had an effect on prehistoric occupation at Yaquina Head. The absence of a source for the sandy eolian deposits on the headland, within which the prehistoric occupation took place, led to the hypothesis that a sediment apron formerly existed at the base of Yaquina Head. In addition to providing a means by which sand could be transported to the top of the headland, this feature would also have provided greater access to the rocky intertidal zone below for the site's inhabitants. Rising sea levels within the last few thousand years would have resulted in the erosion of the sediment apron, and the consequent reduction in access to the rocky intertidal zone may have been a factor in the abandonment of the settlement on Yaquina Head around 2000 years ago.

As was the case at Tahkenitch Landing, the results of archaeological investigations strongly suggest that occupation at Yaquina Head, and the ultimate abandonment of the site, correlated with changes in the coastal environment. Together with Tahkenitch Landing, Yaquina Head appears to support the idea that the distribution of coastal environments and habitats was considerably different 3000 years ago than today. Variations in sea level, as well as depositional and erosional activity, have resulted in continually changing conditions, and the emergence and disappearance of specific habitats. This situation, then, underscores the importance of taking into account the dynamic nature of the coastal environment, on both local and regional scales, in reconstructing the prehistory of the Oregon coast.

REGIONAL SETTLEMENT PATTERNS: YAQUINA HEAD AND THE QUESTION OF "TERRESTRIALLY-ORIENTED" COASTAL SITES

While virtually all previous archaeological investigations in this region have focused on shell middens, attention has recently been drawn to another class of settlements found along the southern Oregon coast that have been referred to as "terrestrial oriented" or "bluff" sites (Ross 1984). These sites occur on headlands or cliffs high above the ocean's edge, and contain large amounts of stone artifacts including projectile points, bifaces, scrapers, gravers, and lithic debitage. Organic remains, including evidence of shellfish exploitation, are apparently lacking at these sites.

As of this time only one "bluff" site, situated on Blacklock Point (35CU75) on the southern Oregon coast, has been tested, but the results have been incompletely reported (Ross 1984). Although no projectile points were apparently recovered during the test excavations, specimens found at this site by relic collectors suggest considerable antiquity for the occupation (Pullen 1981:145-147). A single radiocarbon date of 2750 ± 55 BP, based on charcoal from strata exposed in the cliff face, was obtained (Ross 1984:248). Assuming that this radiocarbon date was representative, Ross (1984) concluded that these "terrestrial oriented" sites were most likely occupied by a separate ethnic group with interior affiliations that had arrived on the coast relatively recently rather than by the indigenous marine-oriented peoples.

In view of its location on a headland above the ocean's edge, Ross was of the opinion that the non-shell strata at Yaquina Head, which contained large amounts of lithic artifacts and debitage, fits into his classification of "terrestrial oriented" sites (Richard E. Ross, personal communication 1986). However, as described in this report, the non-shell strata at Yaquina Head contain considerable evidence of marine orientation; they are simply lacking in evidence of shellfish exploitation. Given that only one "bluff" site has been tested, it seems premature to classify the others as "terrestrial oriented" simply because they lack shell and are situated on bluffs above the ocean, particularly in light of the clear marine orientation in the non-shell strata at Yaquina Head.

The Blacklock Point site is reported to be lacking in organic remains (Ross 1984:246). It appears, on the basis of the brief description so far available, that this site was not a settlement at which subsistence activities were carried out, but that it instead served as a task-specific site where core reduction and shaped stone tool manufacture were the principal activities conducted. At the present time, there seems to be no evidence one way or the other for classifying the adaptation of its prehistoric inhabitants as either marine or terrestrial oriented.

The evidence from Yaquina Head thus does not support the idea that "terrestrial oriented" manifestations reflect the arrival on the Oregon coast of a separate ethnic group practicing an interior adaptation. Instead, the evidence from this site suggests that the "terrestrial oriented" manifestation and the shell midden simply represent separate activity areas within the same settlement. Similar situations in which "terrestrial oriented" manifestations and shell middens occur in close proximity to one another are known to exist at several of the sites discussed by Ross (1984), including Blacklock Point (Minor 1986:84-87). It seems reasonable to suggest that they, too, may represent separate activity areas within one large settlement.

Extrapolating from the activity area concept, it seems highly likely that rather than representing evidence of a relatively recent migration from the interior, some of the "terrestrial oriented" sites

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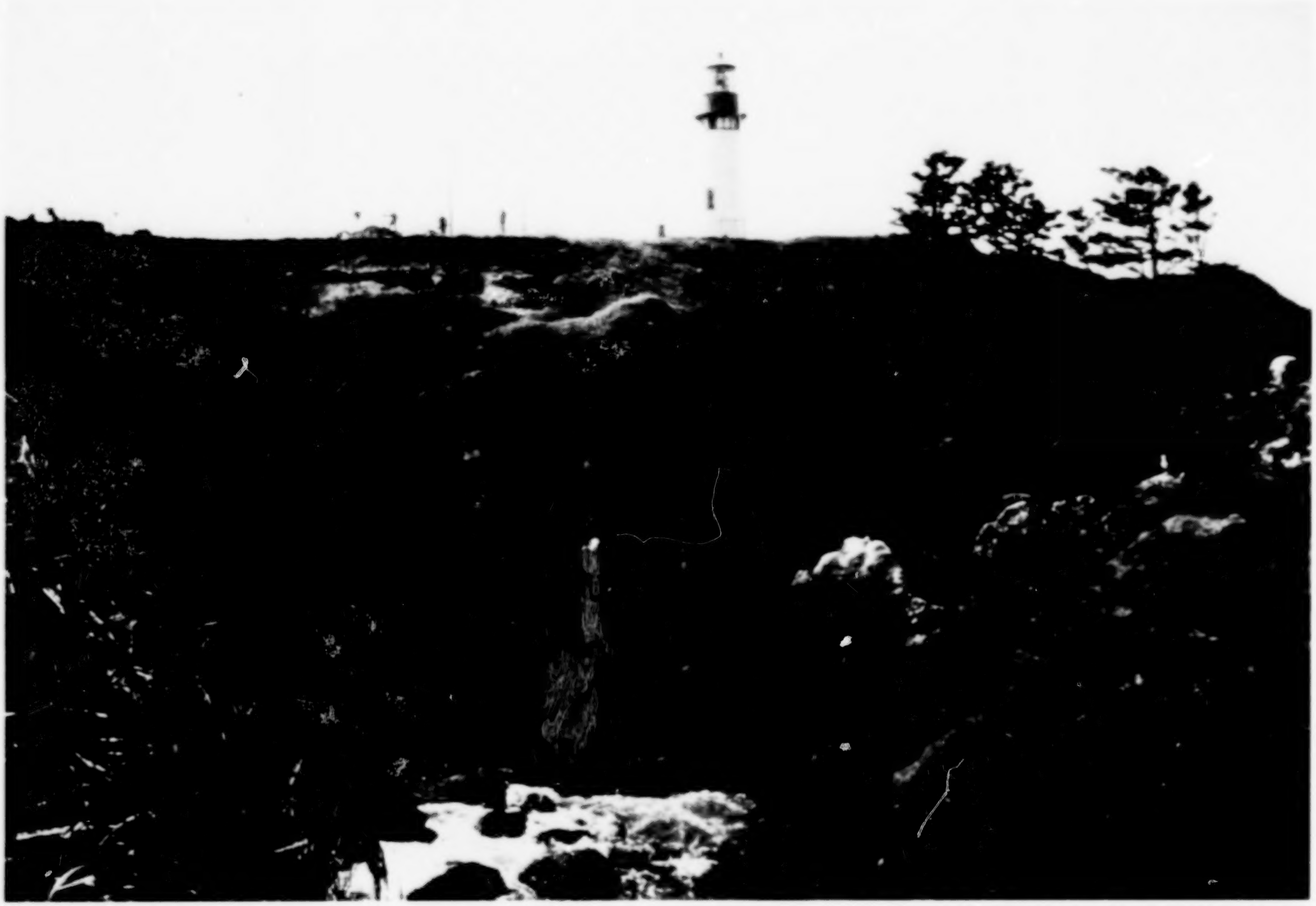

Figure 10-1. View of site area showing the steep cliff along the north face of Yaquina Head.

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on the Oregon coast simply represent different aspects of the seasonal-subsistence round of prehistoric coastal peoples (Minor and Toepel 1983:232). Although Ross (1984:248-250) has argued that these sites contain very different lithic assemblages from those represented at marine oriented sites, this assertion is not substantiated by available data.

Detailed descriptions of the lithic assemblages from bluff sites are not available. However, Pullen (1981) has classified projectile points found by relic collectors at Blacklock Point, and it is clear that many of the point types found at this site are also represented at marine shell middens in this area, including Patrick's Point (4-HUM-118) and Tsurai (4-HUM-169) in northwestern California, and Bagnell's Ferry (35CU25), Lone Ranch Creek (35CU37), Pistol River (35CU61), and Port Orford Heads (35CU9) on the southern Oregon coast. Thus, contrary to the contention by Ross (1984), available data indicate that projectile points similar to the types represented at a "terrestrial oriented" site do also occur at marine shell middens in this region.

The presence of a "terrestrial-oriented" manifestation in Component II at Yaquina Head helps to clarify the cultural position of these sites in the archaeological record of the Oregon coast. First, the distribution of sites with non-shell strata containing large amounts of lithic artifacts and debitage, previously limited to the south coast, has now been extended to the north-central coast. Second, at Yaquina Head the non-shell Stratum 1 and the shell-bearing Stratum 2 interfingered stratigraphically, and took place contemporaneously, indicating that both were almost certainly occupied by the same people. Third, analysis of the cultural materials indicates that, except for the actual molluscan remains and the presence of bone, antler, and shell artifacts, the same activities were conducted by the inhabitants responsible for the deposition of both strata.

The evidence from Yaquina Head, then, suggests that some "terrestrial oriented" manifestations may simply represent activity areas associated with marine oriented shell middens that together comprise relatively complex prehistoric settlements. Other "terrestrial oriented" sites probably represent settlements which had different functional roles in the settlement patterns of marine oriented peoples. In this respect, it is noteworthy that several of the "terrestrial oriented" localities discussed by Ross (1984) may contain occupations that are perhaps 5000 to 8000 years old, based on cross-dating of the temporally-diagnostic projectile points found at these localities by relic collectors (Pullen 1981). In view of the clear pattern indicating that the postglacial rise in sea level has inundated most evidence of occupation along the coastal margin more than 3000 years old, these earlier sites may represent aspects of an earlier settlement pattern which, because of their locations on headlands and steep cliffs, have survived the effects of postglacial sea level rise and subsequent erosion that have destroyed so much of the rest of the archaeological record along the Oregon coast.

SUBSISTENCE PRACTICES

Analyses of the marine shell and vertebrate faunal assemblages from Yaquina Head amply demonstrate that the people who lived at this site were oriented towards the broad exploitation of locally available resources from a variety of terrestrial habitats as well as intertidal, nearshore, and offshore marine habitats. Analysis of the wide variety of fauna represented provided detailed information about the range of fauna and habitats exploited and the seasons during which the site was occupied. No direct evidence was recovered of the technology employed in various subsistence activities; however, some inferences are possible.

The fish assemblage from Yaquina Head is similar in composition to those assemblages analyzed by Zontek (1982) from the Seal Rock (35LNC14) and Neptune (35LA3) shell middens. Zontek suggests that these assemblages reflect hook and line fisheries; the reasoning he used in making that inference (Zontek 1982:93) applies to the Yaquina Head site as well. First, the species composition represented is similar to that obtained by Barker (1974) using troll and jig gear in his fishing experiments at Seal Rock. Second, no notched or grooved stones that might have been used as net weights were apparently found at the Neptune or Seal Rock sites; nor were any recovered at Yaquina Head. A single antler artifact interpreted as a net shuttle, recovered from Stratum 2, is the only evidence that might suggest use of nets for fishing.

An unusually detailed record of bird exploitation along the Oregon coast is provided by the Yaquina Head assemblage. Today Yaquina Head provides habitats for many nesting and migratory birds; apparently this was the case in the prehistoric past, as well. The presence in the assemblage of birds that only visit the Oregon coast at restricted times of the year allowed inferences to be made regarding season of site occupation.

The bird assemblage permits another inference to be drawn regarding an aspect of hunting technology employed by the site's inhabitants. Specifically, it appears from the faunal evidence that some sort of seagoing watercraft was employed in some of the subsistence activities at Yaquina Head. Birds that are present offshore along the Oregon coast, but do not come very near to shore (albatross, shearwaters, fulmars) are significantly represented in the Yaquina Head faunal assemblage. The few halibut bones and some of the sea mammal remains recovered from the site provide further support for the idea that this offshore niche was exploited. It seems, then, that the prehistoric inhabitants of Yaquina Head were not bound to the shoreline, but apparently possessed the technology and desire to exploit offshore ocean habitats. The vertebrate faunal assemblage from Yaquina Head has provided the strongest evidence so far available of the use of watercraft by prehistoric peoples along the Oregon coast.

In addition to the information regarding reconstruction of prehistoric subsistence activities and season of site occupation, the faunal assemblage from Yaquina Head provided information regarding changing distributions of various species through time. Although the sea otter has been reintroduced (with limited success) along the Oregon coast, it had been hunted to extinction in Oregon earlier this century. Its presence in archaeological sites, including Yaquina Head, constitutes an important data base regarding its former range and abundance.

Another species that is nearly extinct today is the short-tailed albatross (Diomedea albatrus). It is believed that the albatross represented in the Yaquina Head assemblage is this species, although lack of sufficient comparative material made the identification tentative. This species was reported in Oregon in the 19th and early 20th centuries; it has also been reported from other coastal shell middens (Gabrielson and Jewett 1970:81). Very little is known about this species, and confirmation of this identification will provide an important contribution to the record of the short-tailed albatross in Oregon.

Perhaps one of the most interesting changes in faunal distribution implied by the faunal assemblage from Yaquina Head is that of the northern fur seal (Callorhinus ursinus). As discussed in Chapter 5, the presence of 10-11 week old northern fur seals at Yaquina Head, as well as not uncommon representation of this species at other sites in Oregon, Washington, and British Columbia, strongly suggests that the distribution of northern fur seal breeding grounds was different in the prehistoric past than it is today. It seems likely that this species was breeding at several locations along the northeast Pacific coast, and probably somewhere not too far from Yaquina Head.

MORTUARY PRACTICES

The human burials encountered at Yaquina Head have provided new information concerning the mortuary practices of the prehistoric inhabitants of the Oregon coast. Although apparently representing an unrelated event, the adult male burial was found at the same elevation as the infant burial and the whale bone artifact, from which a radiocarbon date of 3400 ± 240 BP was obtained. In each case, the pits in which the burials were placed occurred in the lower portions of Component II. The infant burial represents the earliest human remains so far documented along the Oregon coast. The adult male burial is undated, but its position in the lower portions of Component II suggests that it is approximately the same age.

The adult male burial was interred on his side in a flexed position. Flexed burials are not unknown in this region, but their occurrence is restricted to the south coast, where they appear to represent an aspect of the late prehistoric culture of Athapascan-speaking peoples (Minor and Toepel 1983:237). In contrast, the supine burial position is most common in late prehistoric burials on the central and northern Oregon coast. Ethnographic data on Alsea-Yaquina burial practices mention only canoes burials (Barnett 1937:182; Drucker 1939:97).

It is thus noteworthy that a burial position is represented at Yaquina Head that is different from that practiced by the later prehistoric and historic native peoples of this region. In this respect, the flexed burial at Yaquina Head conforms to the mortuary practice in the Willamette Valley (Minor and Toepel 1981:169, 171-173) and, further afield, in the Columbia Plateau (Sprague 1971). Considering the age of the Yaquina Head burials, it seems reasonable to suggest that the mortuary practices at this site represent an earlier cultural pattern that existed prior to the spread of Northwest Coast Culture to this section of the Oregon coast.

CONCLUSION

As a result of the archaeological investigations described in this report, Yaquina Head joins Tahkenitch Landing as the only archaeological sites along the Oregon coast so far known to contain substantive evidence of prehistoric occupation before 3000 BP. These two sites exhibit certain similarities, most notably in the fact that both functioned as villages during part of their occupation spans. Furthermore, their occupations overlap chronologically, with the heaviest use of Tahkenitch Landing between 5200-3000 BP and the contemporaneous deposition of Stratum 1 and 2 at Yaquina Head dating between 3200-2000 BP.

At the same time, however, it is difficult to make direct comparisons between these two sites, as they were situated in such different environmental settings: Tahkenitch Landing on an estuary and Yaquina Head on the exposed outer coast. In view of this situation, Tahkenitch Landing and Yaquina Head might better be seen as complementary to one another, each representing a different aspect of the settlement-subsistence pattern practiced by the earlier prehistoric inhabitants of the Oregon coast.

In conjunction with the environmental and archaeological record at Tahkenitch Landing, the results of archaeological investigations at Yaquina Head support the idea that significant environmental changes took place on the Oregon coast shortly before 3000 years ago. At Yaquina Head the earliest evidence of shellfish gathering occurs at 3120 ± 60 BP. Initial deposition of the shell midden at this time is thought to be associated with a change in the local site environment.

While the exact nature of this change is unknown, it may well have been connected somehow with the establishment of marine shellfish beds, or in the increased accessibility to existing beds.

At Tahkenitch Landing, the abrupt cessation of activities associated with shellfish gathering which occurred at approximately 3000 BP was attributed to a change in the immediate site environment from a marine estuary to a dune-dammed freshwater lake. The formation of freshwater Tahkenitch Lake, in turn, is thought to have resulted from environmental changes of more regional scale, involving dune-building activity and changes in sea level (Minor and Toepel 1986; McDowell 1986).

At several other prehistoric sites along the Oregon coast the date of initial occupation appears to be in the vicinity of 3000 BP, including 35CU62 near the mouth of the Pistol River: 3000 ± 90 BP (Cressman 1977:194); Umpqua/Eden (35DO83) near the mouth of the Umpqua River: 2960 ± 45 BP (Ross and Snyder 1986); and Whale Cove (35LNC60), just south of Depoe Bay: 3010 ± 90/3040 ± 70 BP (same sample run twice) (R. Lee Lyman, personal communication 1987).

The only substantive occupations at coastal sites in Oregon that predate 3000 BP are Tahkenitch Landing, which is presently located in a protected, inland setting, and Yaquina Head, situated on the top of a prominent headland. Early archaeological sites situated close to the ocean's edge were vulnerable to erosion (and even Yaquina Head is being eroded away) and subject to submergence by rising sea levels. Until recently, it was thought that this submergence was due mainly to eustatic sea level rise resulting from the melting of continental glaciers, but it now appears that tectonic activity resulting in land subsidence may have been a factor as well. In view of the strong evidence from Tahkenitch Landing, plus the more suggestive evidence from Yaquina Head, of changes in local site settings, it seems highly likely that the paucity of earlier archaeological sites along the Oregon coast is a direct result of regional changes in the coastal environment relating to fluctuations in sea level sometime shortly before 3000 BP.

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APPENDIX:

AUGER HOLE DATA SUMMARY

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Table A-1. Auger hole data summary for Yaquina Head.

Auger Hole	Depth Below Surface	Stratum	Fill Description	Cultural Material
1W	0-90 cm	1	dark brown sand and parking lot gravels	none
	80-90 cm	1	same as above	charcoal
	90-100 cm	1	same as above	1 basalt flake, charcoal
	100-110 cm	1	same as above	FCR, charcoal
	110-120 cm	1	same as above	charcoal
	120-170 cm	3/4	dark brown orangish soil with cemented sand chunks	none
1C	0-20 cm	1	dark silty sand with parking lot gravels	none
	20-30 cm	1	same as above	nail fragments; 1 chert flake; small shell bits
	30-40cm	1	dark silty sand	3 basalt flakes; FCR; shell bits
	40-50 cm	2	darker sand with shell	1 nail; 1 chert and 1 basalt flake; more FCR
	50-60 cm	2	dark sand with organics and increasing shell	1 basalt flake; FCR; charcoal, bone, shell
	60-70 cm	2	sand with silt and shell	1 unident. large mammal bone; 2 unident. bones; FCR
	70-80 cm	2	same as above	1 unident. large mammal bone; 6 unident. bones; 1 unident. bird bone
	80-90 cm	2	darker sand with increasing shell	1 pinniped phalanx, 1 unident. large mammal bone; 1 unident. fish bone; FCR
	90-100 cm	2	more silty and compact fill with shell	2 fish (greenling) bones; 1 fish (herring) bone, 8 unident. fish bones
	100-110 cm	2	decrease in shell	bone
	110-120 cm	2	further decrease in shell; redder silt	3 unident. large mammal bones; charcoal
	120-140 cm	2/3	more moist, redder fill with small amount of shell	none
	140-150 cm	3	red silty fill	1 chert flake
	150-160 cm	3	same as above	horse barnacle fragments (intrusive?)
	160-185 cm	4	orange-red silt; more compact	none
2C	0-40 cm	1	brown sand with silt and road gravels	none
	40-60 cm	1	same as above	FCR
	60-80 cm	1	same as above	none
	80-100 cm	1	same as above	charcoal chunks
	100-140 cm	3	yellow compact sand chunks in sand fill	charcoal
	140-157 cm	4	increasing yellow-orange sand	none
	below 157 cm	4	compact sand layer	none
3C	0-10 cm	1	brown sand silt with road gravels	1 metal fragment
	10-30 cm	1	same as above	none
	30-50 cm	1	brown sandy silt	FCR, charcoal
	60-70 cm	1	same as above	none
	70-80 cm	[illegible]	same as above	FCR
	90-110 cm	1	same as above	charcoal
	110-140 cm	3	yellow-orange sand with chunks	charcoal
	140-160 cm	4	increasing compactness	none
	below 160 cm	4	yellow-orange compact sand layer	none

Table A-1 (continued)

Auger Hole	Depth Below Surface	Stratum	Fill Description	Cultural Material
4C	0-20 cm	gravels	road gravels	glass and metal fragments
	20-50 cm	1	brown silty sand	none
	50-60 cm	1	same as above	1 chert flake
	60-70 cm	1	same as above	FCR
	70-90 cm	1	same as above	charcoal
	90-110 cm	3	compact orange sand chunks in darker fill	FCR; charcoal flecks
	110-180 cm	4	yellow-orange compact sand	none
5C	0-20 cm	gravels	road gravels in brown silt	coal and metal fragments
	20-50 cm	1	brown silt with scattered shell bits	shell
	50-70 cm	1	brown silt with no shell	none
	70-90 cm	1	brown silty sand	1 shell bit; charcoal
	90-100 cm	1	brown silty sand with yellowish sand chunks	3 chert flakes, 1 basalt flake
	100-110 cm	1	same as above	3 basalt flakes
	110-120 cm	1	same as above	charcoal
	120-130 cm	1	same as above	1 chert flake; 1 shell; charcoal
	130-150 cm	1	same as above	charcoal
	150-168 cm	3/4	increasing orangish compact sand	none
6C	0-10 cm	1	brown silt with road gravels	porcelain, metal, brick fragments, 1 unident. bird bone; 5 shell bits
	10-20 cm	1	same as above	metal fragment
	20-40 cm	1	brown silt	none
	40-50 cm	1	same as above	1 chert flake; FCR
	50-100 cm	1	same as above	none
	100-120 cm	3	brown silt with yellowish sand chunks	none
	120-150 cm	3/4	increasing sand chunks and yellow sand fill	none
1E	0-70 cm	1	dune sand	none
	70-80 cm	1	dark sand	1 chert flake, charcoal
	80-90 cm	1	same as above	FCR, charcoal
	90-100 cm	1	same as above	1 chert flake, 1 basalt flake, charcoal
	100-110 cm	2	dark sand/shell midden	1 chert flake, FCR, charcoal
	110-120 cm	2	shell midden	1 unident. large mammal bone, 1 unident. mammal bone, FCR, charcoal
	120-130 cm	2	same as above	1 basalt flake, 1 unident. fish bone, 1 unident. bird bone, 6 unident. bones, charcoal
	130-140 cm	2	same as above	1 chert flake, 1 fish (greenling) bone, 1 unident. large mammal bone, 1 unident. bone, charcoal
	140-150 cm	2	same as above	1 chert flake, FCR, charcoal
	150-160 cm	2	same as above	1 basalt flake, 2 unident. bird bones, FCR, charcoal
	160-170 cm	2	shell midden with black silt matrix	1 unident. large mammal bone, 2 unident. bones, FCR rock, charcoal
	170-190 cm	2	black silt with some shell	charcoal
	190-200 cm	2/1?	black silt with very little shell	1 unident. mammal bone, charcoal
	200-210 cm	2/1?	same as above	charcoal
	210-220 cm	2/3	mixed shell and yellow-brown silt	FCR, charcoal
	220-230 cm	2/3	same as above	1 bird (loon) bone, charcoal
	230-240 cm	3	compact orange silt	none

Table A-1 (continued)

Auger Hole	Depth Below Surface	Stratum	Fill Description	Cultural Material
2E	0-20 cm	1	light sand	wind-blown shell bits
	20-30 cm	1	same as above	1 bird (albatross?) bone, 1 nail
	30-60 cm	1	same as above	charcoal, nails, 1 screw, tin foil
	60-80 cm	1	dark sand	charcoal
	80-90 cm	1	same as above	FCR, charcoal, shell bits
	90-100 cm	1	same as above	1 chert flake, 5 basalt flakes, FCR, charcoal
	100-110 cm	2	shell midden	5 chert flakes, 1 basalt flake, 4 unident. fish bones, FCR, charcoal
	110-120 cm	2	shell midden	1 chert flake, FCR, charcoal
	120-130 cm	2	shell midden	FCR, charcoal
	130-140 cm	2	shell midden	1 basalt flake, FCR, charcoal
	140-150 cm	3	dark silty sand	charcoal; 2 shell bits
	150-160 cm	3	dark clayey silt	FCR; few shell bits
	160-170 cm	3	same as above	charcoal
3E	0-20 cm	1	light sand	none
	20-40 cm	1	sand with rounded gravel and shell bits	glass, metal, wind-blown shell
	40-50 cm	1	darker sand	wind-blown shell bits
	50-60 cm	1	same as above	charcoal; shell bits
	60-70 cm	1	same as above	1 chert flake, charcoal
	70-80 cm	1	same as above	1 chert flake, FCR, charcoal
	80-90 cm	2	shell midden	FCR, charcoal
	90-100 cm	2	same as above	1 chert flake, 3 basalt flakes, 8 unident. large mammal bones, 3 unident. bones, FCR, charcoal
	100-110 cm	2	same as above	3 basalt flakes, FCR, charcoal
	110-120 cm	2/3	shell midden mixed with yellowish silt	FCR, charcoal
	120-130 cm	3	yellowish silt	FCR, charcoal
	130-140 cm	3	same as above	charcoal
4E	0-20 cm	1	road gravels and sand	none
	20-50 cm	1	dark sand	none
	50-60 cm	1	same as above	charcoal; 2 shell bits
	60-70 cm	1	same as above	2 chert flakes, 1 basalt flake, charcoal
	70-80 cm	1	same as above	1 chert flake, 1 basalt flake, FCR, charcoal, 1 shell
	80-90 cm	1	same as above	5 chert flakes, FCR, charcoal
	90-100 cm	1	same as above	FCR, charcoal
	100-110 cm	3	yellowish silt	charcoal
	110-120 cm	3	same as above	1 chert flake, charcoal
	120-130 cm	3/4	same as above	none
1EE	0-60 cm	1	small pebbles in sand	none
	60-70 cm	1	darker silty sand with charcoal	1 basalt flake
	70-80 cm	1	same as above	none
	80-90 cm	1	same as above	1 basalt flake
	90-100 cm	1	same as above	FCR
	100-130 cm	1	same as above	FCR
	130-160 cm	1	same as above	none
	160-180 cm	3	lighter, more clay, cemented sand chunks	charcoal

Table A-1 (continued)

Auger Hole	Depth Below Surface	Stratum	Fill Description	Cultural Material
2EE	0-40 cm	1	sand with pebble fill and wind-blown shell	none
	40-50 cm	1	darker sand	charcoal
	50-60 cm	1	same as above	1 basalt flake, charcoal
	60-90 cm	1	same as above	charcoal
	90-100 cm	1	same as above	1 chert flake, FCR
	100-110 cm	1/3	darker sand with red sand chunks	FCR
	110-140 cm	1/3	same as above	FCR, charcoal
	140-150 cm	1/3	same as above	charcoal
	150-160 cm	3	yellow-orange sand with reddish chunks	none
1P	0-100 cm	Dune	light brown sand with roots	none
	100-210 cm	1	medium brown sand with charcoal; darkness increases with depth	charcoal
	210-250 cm	1	sandy clay to extent of auger	FCR, charcoal

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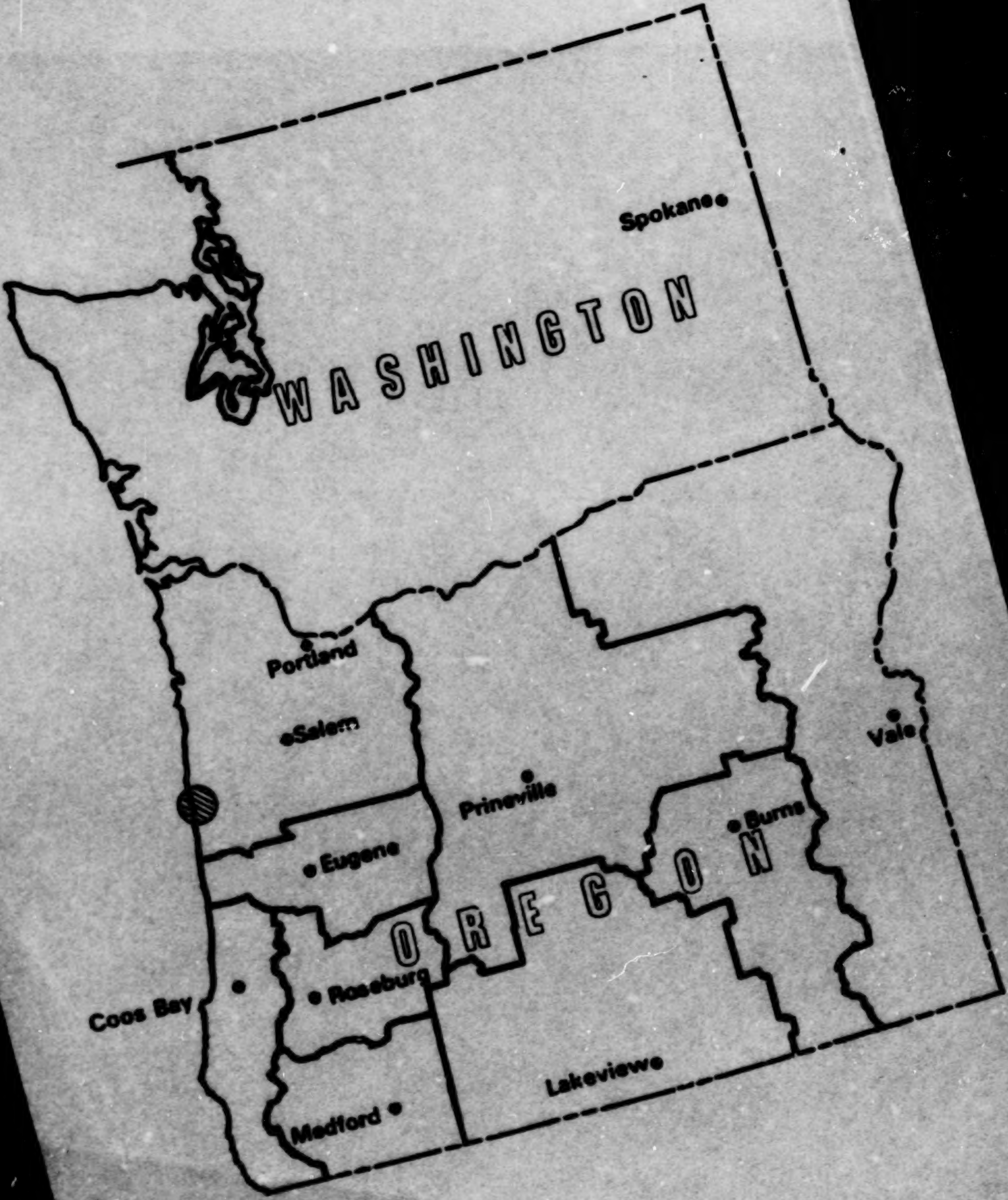
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